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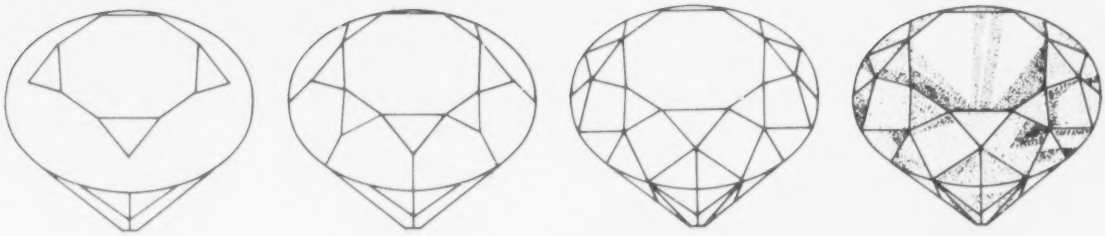
North American Survey of Geoscientists



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North American Survey of Geoscientists

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Introduction

The American Geological Institute (AGI) conducted the *North American Survey of Geoscientists* in response to the need for quantitative information on the composition and characteristics of the geoscience profession in the United States and Canada. To our knowledge, this is the first survey to describe the profession specifically and in such detail.

Traditional surveys of the sciences have always had difficulty in isolating geoscientists as a distinct population. Details about the profession usually are assigned to more generalized categories or simply are omitted. One measure of the diversity of the geosciences is its multitude of professional societies. As the nucleus for nineteen such distinct and distinguished organizations, AGI is privileged to claim a familiarity with the profession's complexity not enjoyed by those agencies that regularly conduct science resources surveys. Because of that unique role, AGI launched an ambitious program to acquaint the geoscientific profession with itself.

The data in the U.S. Section of this report are the results of a survey sent in May 1986 to approximately 14,000 geoscientists. About 3,000 of the sample total returned the questionnaire, for a response rate of 21%. The potential sampling error is +/- 1.8%.

At the same time, the survey was also sent to a sample of 5,000 alumni of 30 U.S. degree-granting geoscience departments. These departments were selected on the basis of faculty profile, size, and geographic location. About 1,700 responded to that survey, for a response rate of 34% and a potential sampling error of +/- 2.4%.

For the Canadian Section, questionnaires were mailed in May 1987 to 6,000 geoscientists of whom about 45% responded. The potential sampling error is +/- 1.9%.

For the U.S. and Canadian sections of the survey, the report is organized roughly according to the sequence of the survey questions: educational background and training, employment and occupational focus, and demographic data. Selected data from the survey of geoscience department alumni (the "graduate survey") and the U.S. section are compared in a separate section. A separate volume, of more than 200 pages, comprises the complete set of cross-tabulations for the U.S. and Canadian surveys. That volume is available at no charge and only on request.

AGI plans to repeat the survey every 4 to 5 years. It is hoped that suggestions and comments from concerned geoscientists will help in improving the format and kinds of data presented.

AGI gratefully acknowledges the diligent efforts of the AGI Manpower Advisory Committee and the AGI Foundation, the generous funding support of many corporations, federal agencies, and professional societies, and the cooperation of the geoscientists who provided the information.

I. Development and Description of the Survey

Historically, the supply of and demand for geoscientists have been out of phase. In fact, that imbalance has become an accepted though lamentable characteristic. Compounding that problem has been a chronic fluctuation in geoscientific employment, the "boom/bust" cycle. AGI felt that by quantifying the employment and demographic details of the profession, there would result a better understanding of how and why those problems occur. With that information, the profession could then begin to address its training and hiring mechanisms, with a view toward reducing the imbalances.

In 1984, AGI began planning a comprehensive survey of the geoscientific profession. The AGI Manpower Advisory Committee, and its invited representatives from selected geoscientific employers, designed a survey questionnaire to provide an in-depth profile of the profession. The broad topics would included educational background and training, employment and occupational focus, and demographic data. The AGI Foundation had already begun a successful funding drive to support this survey and to establish a continuing survey program.

To assess the professional skills of the geoscience population, several survey questions focused on academic training (degrees), specialties in which the respondents are qualified[1] and specialties actually practiced. These data provide an estimate of "coverage," i.e., the ratio of persons qualified in a specialty compared to the number of persons practicing that specialty. In this fashion, the profession's reserves can be evaluated. Non-geoscientific specialties were included to assess the percentages of the professional population that have crossed over from other major academic and employment backgrounds. Such information also provides a measure of the flexibility of the profession to absorb and integrate non-geoscientifically trained personnel.[2]

One of the initial requirements for conducting this survey of geoscientists was to develop an employment classification system to describe accurately both the kind of work performed and the employer for which that work was performed. Although AGI had already developed such a system for geoscience teaching (used to classify faculty teaching and research specialties in the Directory of Geoscience Departments), there was still a need for a comprehensive and consistent classification for the wider spectrum of geoscientific employment. The resulting employer classification consists of nine major groups, further broken down into detailed subdivisions:

1. **Academia:** Secondary school; junior college/technical; college/university.
2. **Government:** Federal/national; state/local/provincial military; other than U.S. or Canada.
3. **Petroleum Industry:** Integrated petroleum company; independent exploration and production company; drilling contractor; oil field service; consultant; other.
4. **Mining or Minerals Industry:** Exploration and/or producing company; consultant; other.
5. **Engineering, Construction, Consulting:** Construction and/or engineering firm; geoscientific studies; consultant; other.
6. **Research and Related:** Research institute or laboratory; library; museum; other.
7. **Other Employers with Geoscientific Requirements:** Banking/financial; equipment manufacturers; law; journalism; media; other.
8. **Employer with No Requirements for Geoscientific Expertise:** By your choice; by necessity, but want to return to geoscientific position; by necessity, but do not want to return to geoscientific position.
9. **Not Employed:** Retired; unemployed but want to return to geoscientific position; unemployed but do not want to return to geoscientific position; student; other.

---

1 To hold a geoscientific specialty, the respondent had to have either a degree in the specialty or 3 or more years' experience in the specialty.

2 A reverse migration analysis is also possible -- to assess that segment of the profession that has, for any number of reasons, applied geoscientific training to non-geoscientific employment.

This detailed categorization of employer type was amplified through a question on occupational objectives. Major categories were defined as follows:

1. **Finding and Developing Oil and Gas:** Research; seismic data acquisition and processing; exploration evaluation; field development; other.
2. **Finding and Developing Other Resources:** Metals; coal; industrial minerals, including agricultural; water; other.
3. **Geotechnical Applications:** Environmental and health investigation; construction and civil development; hazard assessment; other.
4. **Public Policy Administration:**
5. **Geoscientific Education, Basic Research, and Communications:** Teaching; basic research; library; museum; journalism/editing; other.
6. **Other Geoscientific Application:**
7. **Non-geoscientific Related:**
8. **Not Currently Employed.**

The combination of answers to these two questions on employer type and occupational objectives over time will provide an indication of employment trends (e.g., increased attention to waste disposal, environmental concerns, hydrology) by employer type and occupational objective.

The geoscientific specialties were organized in major groupings that were used to determine the initial population breakdown. The major categories and their subspecialties are as follows:

1. **Geology**

   Atmospheric Science
   Economic and Mining Geology
   Environmental Geology
   General Geology and Earth Science
   Geochemistry
   Geomorphology
   Marine Geology/Marine Geophysics
   Mathematical Geology and Geostatistics
   Mineralogy
   Oceanography
   Paleontology and Palynology
   Petroleum Geology
   Petrology
   Planetology
   Remote Sensing
   Sedimentology
   Soil Science
   Stratigraphy
   Structural Geology and Tectonics
   Volcanology

2. **Geophysics**

   Geophysics
   Petroleum Geophysics

3. **Petroleum Engineering**
4. **Mining Engineering**
5. **Engineering Geology and Engineering Geophysics**
6. **Hydrology and Hydrogeology**

The non-geoscientific specialties are:

1. Chemistry
2. Civil Engineering
3. Computer Science
4. Electrical Engineering
5. Liberal Arts
6. Mathematics
7. Mechanical Engineering
8. Physics
9. Other Engineering/Scientific
10. Other

Several questions were intended to assess and detail demographic data. Thus, questions on age, race/ethnic origin, gender, citizenship, and geographic work location produce the much-needed profile of the profession. A question on professional society membership provided information for a number of purposes: as a test of the mailing sample, as a measure of the profession's membership participation in professional societies, and as an indication of the number who do not belong to any professional geoscientific organization.

II. Survey Results

A. Total Population of U.S. Geoscientists

An important objective of the survey was to develop an estimate of the total population of U.S. geoscientists. Question X provided data on membership in professional geoscientific organizations. Membership percentages from the survey were compared to the known membership size of four such organizations: American Association of Petroleum Geologists, Geological Society of America, Society of Mining Engineers, and Society of Petroleum Engineers of AIME. Table 1 provides the survey's membership percentages for those four organizations:

Table 1

Derivation of Percentage of Survey Population Belonging to Professional Geoscientific Organizations

Organization	Total Professional Geoscience Membership[1]	Survey Memberships Reported	% Reported
American Association of Petroleum Geologists	22,600	645	2.85
Geological Society of America	14,000	368	2.63
Society of Mining Engineers	10,000	362	3.62
Society of Petroleum Engineers of AIME	40,000	1,096	2.74
TOTAL	**86,600**	**2,471**	**2.85**

Since approximately 2.85% of the four organizations responded to the survey, a preliminary total population estimate was derived by dividing the total number of survey respondents (3,026) by 2.85%:

$$\frac{3,026}{.0285} = 106,175$$

That estimate, rounded to 106,000, represents the U.S. geoscience population that reported memberships in one or more professional organizations.

Since the commercial list was presumably derived from membership lists, other data were combined with that of the principal survey to determine the number of geoscientists who did not belong to any professional organizations. The parallel survey of geoscience department graduates provided data derived independently of membership in professional organizations. In that survey, approximately 28% of the respondents indicated no membership in professional organizations. The number of respondents from both surveys that indicated no professional organization membership is as follows:

	Number of Respondents	Survey Sample Size	% Reporting No Membership
Principal survey	94	3,026	3.1
Graduate survey	487	1,727	28.2
Combined Total	581	4,753	12.2

Therefore, 12.2% of the combined survey sample size belongs to no professional organization. In other words, the initial population estimate of 106,000 represents 88% of the total population. The final population estimate is, therefore, 120,000 (120,454, rounded to nearest thousand).

To verify this population estimate, figures from the National Science Foundation's report, *U.S. Scientists and Engineers: 1986*, were compared and analyzed. The AGI total agreed closely with the NSF total.

---

1 Full-time U.S. professional membership figures, exclusive of students and those who are retired and unemployed, were provided by the respective organizations.

The next step was to develop an estimate of the geoscience population according to each principal occupational category. Table 2 shows the occupational category breakdown:

Table 2

Derivation of Estimated U.S. Geoscience Population by Occupational Category

	Survey % of Total	Initial Population Estimate (rounded to nearest 1,000)	Adjustment	Final Population Estimate
Geologists, Geochemists, Other Earth Scientists	36.8	44,000	-4,000	40,000
Geophysicists	23.8	29,000	-1,000	28,000
Petroleum Engineers	25.9	31,000		31,000
Mining Engineers	3.1	4,000	+6,000	10,000
Engineering Geologists	7.9	9,000	-3,000	6,000
Hydrologists, Hydrogeologists	2.5	3,000	+2,000	5,000
	100.0	120,000		120,000

Adjustments were made according to the following considerations:

- The number of geologists was decreased by 4,000 and the number of geophysicists was decreased by 1,000, according to information developed through contacts with integrated petroleum and mining companies.
- The number of mining engineers was adjusted upwards to be more consistent with NSF figures and other recent surveys.
- The number of engineering geologists was decreased by 3,000 because the number of respondents indicating membership in the Association of Engineering Geologists suggests that this occupation was over-represented in the survey.
- The number of hydrologists was increased by 2,000 to reflect information based on independent estimates from federal government and other pertinent sources (e.g., state agencies) on the number of hydrologists employed in the federal government, in consulting firms, and as independent consultants.

The final population estimate by occupational category is reasonably consistent with the numbers used in the 1986 NSF report. There is agreement on the total of 79,000 as representing the combined populations of geologists, geophysicists, engineering geologists and hydrologists.

The final step in estimating the total geoscientist population was to cross-tabulate the occupational categories with employer categories and to provide approximate numbers for each cell. The adjustments within occupational categories were incorporated into the final figures.

In several cases, estimates could not be made since there seemed to be so few respondents in those categories. Table 3 shows the final estimates:

Table 3

Estimated U.S. Population of Geoscientists By Employer Category and Occupational Category (rounded to nearest thousand)

	Geologists, Geochemists, Earth Scientists	Geo-physicists	Petroleum Engineers	Mining Engineers	Engineering Geologists	Hydrologists/ Hydro-geologists	Total	% of Total
Academia	5,000	2,400	600	600	*	200	9,000[1]	7.5
Government	5,500	3,000	800	700	2,000	2,000	14,000	11.7
Petroleum Industry	16,500	15,000	28,000	*	*	200	60,000	50.0
Mining/Minerals Industry	3,500	1,000	*	6,500	*	*	11,000	9.2
Engineering, Construction, and Consulting	1,500	700	*	600	3,000	2,200	8,000	6.7
Research and Related	1,500	1,500	*	*	200	*	3,000	2.5
Other Employers with Geoscientific Requirements	2,000	1,000	*	*	*	*	3,000	2.5
Retired and Unemployed	4,000	3,000	2,000	1,500	500	500	12,000	10.0
Total	**40,000[1]**	**28,000**	**31,000**	**10,000**	**6,000**	**5,000**	**120,000**	**100.1[2]**

*** = Too few to estimate**

B. Analysis of Survey Data

1. Educational Background (Question I)

Respondents were asked to indicate the degrees at all levels in which they had received training relevant to their geoscientific employment.

Table 4 shows the geoscientific specialty and degrees earned:

1 Totals within categories are not necessarily the sum of each cell due to rounding and open categories.

2 Percentage totals do not add to 100.0% due to rounding.

Table 4

Geoscientific Specialty and Degree[1]	Number of Degrees				
	BA/BS	MA/MS	PhD	Total	% of Total
Geology					
Atmospheric Science	18	14	5	37	0.8
Economic and Mining Geology	74	68	29	171	3.5
Environmental Geology	10	11	1	22	0.4
General Geology and Earth Science	814	133	20	967	19.6
Geochemistry	15	19	19	53	1.1
Geomorphology	6	13	8	27	0.5
Marine Geology/Marine Geophysics	6	12	13	31	0.6
Mathematical Geology/Geostatistics	3	5	5	13	0.3
Mineralogy	15	14	8	37	0.8
Oceanography	6	11	12	29	0.6
Paleontology and Palynology	6	13	9	28	0.6
Petroleum Geology	153	53	4	210	4.3
Petrology	6	28	27	61	1.2
Planetology	1	3	2	6	0.1
Remote Sensing	3	1	0	4	0.1
Sedimentology	12	32	14	58	1.2
Soil Science	1	0	0	1	0.0
Stratigraphy	9	31	11	51	1.0
Structural Geology and Tectonics	9	26	20	55	1.1
Volcanology	0	4	4	8	0.2
Subtotal	**1,167**	**491**	**211**	**1,869**	**38.0**
Geophysics					
Geophysics	190	205	103	498	10.1
Petroleum Geophysics	34	20	6	60	1.2
Subtotal	**224**	**225**	**109**	**558**	**11.3**
Petroleum Engineering	**511**	**109**	**28**	**648**	**13.1**
Mining Engineering	**138**	**40**	**9**	**187**	**3.8**
Engineering Geology and Engineering Geophysics	**132**	**70**	**16**	**218**	**4.4**
Hydrology and Hydrogeology	**6**	**16**	**6**	**28**	**0.6**
Total Geoscientific	**2,178**	**951**	**379**	**3,508**	**71.2**
Non-Geoscientific					
Chemistry	104	20	17	141	2.9
Civil Engineering	75	29	9	113	2.3
Computer Science	11	9	2	22	0.4
Electrical Engineering	60	21	9	90	1.8
Liberal Arts	65	3	2	70	1.4
Mathematics	142	27	9	178	3.6
Mechanical Engineering	132	11	7	150	3.0
Physics	173	54	35	262	5.3
Other Engineering/Scientific	117	38	21	176	3.6
Other	85	116	20	221	4.5
Total Non-geoscientific	**964**	**328**	**131**	**1,423**	**28.8**
Total Degrees	**3,142**	**1,279**	**510**	**4,931**	**100.0**

1 Although the Associate of Arts degree (AA) was included in the survey questionnaire, those responses were excluded because so few professional geoscientists have only that degree.

a. Most frequent degree (by individual specialty, all degrees combined)

The most frequent degrees held are as follows:

	% Response
General Geology and Earth Sciences	19.6
Petroleum Engineering	13.1
Geophysics	10.1
Engineering Geology/Engineering Geophysics	4.4
Petroleum Geology	4.3

Within general categories of specialties, the most frequent degrees (all degrees combined) are in the following:

	% Response
Geology	37.9
Petroleum Engineering	13.1
Geophysics	11.3
Engineering Geology/Engineering Geophysics	4.4
Mining Engineering	3.8
Hydrology	.6
Non-geoscientific	28.9

Among those with non-geoscientific degrees (but who are working in geoscientific specialties), the most frequent degrees (all degrees combined) are in the following disciplines:

	% Response
Physics	5.3
Mathematics	3.8
Other Engineering/Scientific	3.6
Mechanical Engineering	3.0
Other	4.5

b. Levels of degrees

Of the total degrees held by respondents, 63.7% are bachelor's, 25.9% are master's, and 10.3% are doctoral. Since many individuals hold more than one degree, it was possible to break down the population by highest degree held. The total number of each degree level was divided by the total number of respondents for this question (2,833). The results are as follows:

	% Reporting Degree	
Bachelor's	110.9	(i.e., 10.9% have 2 bachelor's)
Master's	45.2	
PhD	18.0	

For all geoscientific specialties, 62.1% of the survey population have a bachelor's degree, 27.1% have a master's degree, and 10.8% have a doctoral degree as the highest degree.

A total of 28.9% of the total degrees held by respondents was in non-geoscientific specialties. Within this category, 67.7% have a bachelor's degree, 23.0% have a master's degree, and 9.2% have a doctoral degree as the highest degree.

2. Geoscientific Specialty (Questions II and III)

a. Specialty Held

The survey produced information on primary and secondary geoscientific specialties of the professional population.[1] The question was intended to assess the profession's skills as developed through formal education and work experience. Table 5 shows the responses.[2]

Table 5

Geoscientific Specialty	Number	% of Total Specialties	% of Respondents
Geology			
Atmospheric Science	45	0.7	1.6
Economic and Mining Geology	346	5.2	12.3
Environmental Geology	208	3.1	7.4
General Geology and Earth Science	419	6.3	15.0
Geochemistry	138	2.1	4.9
Geomorphology	71	1.1	2.5
Marine Geology/Marine Geophysics	173	2.7	6.2
Mathematical Geology/Geostatistics	89	1.3	3.2
Mineralogy	64	1.0	2.3
Oceanography	68	1.0	2.4
Paleontology and Palynology	28	0.4	1.0
Petroleum Geology	822	12.3	29.3
Petrology	100	1.5	3.6
Planetology	21	0.3	0.7
Remote Sensing	82	1.2	2.9
Sedimentology	108	1.6	3.9
Soil Science	69	1.0	2.5
Stratigraphy	201	3.0	7.2
Structural Geology and Tectonics	282	4.2	10.0
Volcanology	44	0.7	1.5
Subtotal	**3,378**	**50.6**	
Geophysics			
Geophysics	646	9.7	23.1
Petroleum Geophysics	621	9.3	22.2
Subtotal	**1,267**	**19.0**	
Petroleum Engineering	**1,011**	**15.1**	36.1
Mining Engineering	**246**	**3.7**	8.8
Engineering Geology and Engineering Geophysics	**525**	**7.9**	18.7
Hydrology and Hydrogeology	**248**	**3.7**	8.8
Total	**6,675**	**100.0**	

1 To hold a geoscientific specialty, the respondent had to have either a degree in the specialty or 3 or more years' experience in the specialty.

2 The totals for primary and secondary specialties were combined.

The most frequently held specialties are:

	% Response
Petroleum Engineering	36.1
Petroleum Geology	29.3
Geophysics	23.1
Petroleum Geophysics	22.2
Engineering Geology/Engineering Geophysics	18.7

Respondents averaged 2.4 specialties held. This figure was derived by dividing the total specialties held (6,675) by the number of respondents to this question (2,753).

b. Specialty Practiced

Table 6 shows the responses for specialty currently practiced:

Table 6

Specialty Currently Practiced

	Total Specialties	% of Category	% of Total
Geology			
Atmospheric Science	12	1.8	0.4
Economic and Mining Geology	126	19.1	4.5
Environmental Geology	36	5.5	1.3
General Geology and Earth Science	34	5.2	1.2
Geochemistry	24	3.6	0.9
Geomorphology	11	1.7	0.4
Marine Geology/Marine Geophysics	41	6.2	1.5
Mathematical Geology/Geostatistics	10	1.5	0.4
Mineralogy	7	1.1	0.2
Oceanography	12	1.8	0.4
Paleontology and Palynology	10	1.5	0.4
Petroleum Geology	268	40.6	9.6
Petrology	18	2.7	0.6
Planetology	1	0.2	0.0
Remote Sensing	16	2.4	0.6
Sedimentology	11	1.7	0.4
Soil Science	1	0.2	0.0
Stratigraphy	9	1.4	0.3
Structural Geology and Tectonics	9	1.4	0.3
Volcanology	4	0.6	0.1
Subtotal	**660**	**100.2**	**23.5**
Geophysics			
Geophysics	295	46.1	10.5
Petroleum Geophysics	345	53.9	12.4
Subtotal	**640**	**100.0**	**22.9**

	Total Specialties	% of Category	% of Total
Petroleum Engineering	720	100.0	25.7
Mining Engineering	93	100.0	3.3
Engineering Geology and Engineering Geophysics	230	100.0	8.2
Hydrology and Hydrogeology	69	100.0	2.5
Other[1]	390	100.0	13.9
Total	2,802	100.0	100.0

The most frequently practiced specialties are:

	% Response
Petroleum Engineering	25.7
Geology, Geochemistry, and Other Earth Sciences (20 subcategories combined)	23.5
Geophysics	22.9
Engineering Geology/Engineering Geophysics	8.2
Other	13.9

Within the category of geology, geochemistry, and other earth sciences, the most frequently practiced specialties are petroleum geology (40.6%) and economic and mining geology (19.1%). Those two specialties account for nearly 60% of the 20 subcategories. It is likely, however, that many detailed specialties were reported under more general categories or according to the specific work performed. For example, a structural geologist may have chosen engineering geology as a more appropriate category.

According to the survey, there are more who practice petroleum geophysics (12.4%) than petroleum geology (9.6%), although petroleum companies generally employ more geologists than geophysicists. This apparent contradiction may result from large numbers of petroleum geologists who evaluate seismic data and therefore report themselves as geophysicists.

1 This category includes those working in non-geoscientific fields, the retired, and the unemployed.

c. Comparison of degrees earned with specialty practiced

Table 7 compares degrees earned with specialties practiced:

Table 7

Degrees Earned and Specialty Currently Practiced

	Degree Totals[1]	Total Specialties Practiced[2]	Degree Coverage Ratio[3]
Geology			
Atmospheric Science	37	12	3.1
Economic and Mining Geology	171	126	1.4
Environmental Geology	22	36	0.6
General Geology and Earth Science	967	34	28.4
Geochemistry	53	24	2.2
Geomorphology	27	11	2.5
Marine Geology/Marine Geophysics	31	41	0.8
Mathematical Geology/Geostatistics	13	10	1.3
Mineralogy	37	7	5.3
Oceanography	29	12	2.4
Paleontology and Palynology	28	10	2.8
Petroleum Geology	210	268	0.8
Petrology	61	18	3.4
Planetology	6	1	6.0
Remote Sensing	4	16	0.3
Sedimentology	58	11	5.3
Soil Science	1	1	1.0
Stratigraphy	51	9	5.7
Structural Geology and Tectonics	55	9	6.1
Volcanology	8	4	2.0
Subtotal	**1,869**	**660**	**2.8**
Geophysics			
Geophysics	498	295	1.7
Petroleum Geophysics	60	345	0.2
Subtotal	**558**	**640**	**0.9**
Petroleum Engineering	**648**	**720**	**0.9**
Mining Engineering	**187**	**93**	**2.0**
Engineering Geology and Engineering Geophysics	**218**	**230**	**0.9**
Hydrology and Hydrogeology	**28**	**69**	**0.4**
Total	**3,508**	**2,412**	**1.5**

1 Total Bachelor's, Master's, PhDs.

2 Excludes the 390 "Other" responses in Question III.

3 Degree totals divided by total specialties practiced total.

From Table 7 it is clear that in several fields more are practicing a specialty than have degrees in that specialty. Environmental geology, marine geology/marine geophysics, petroleum geology, remote sensing, petroleum geophysics, petroleum engineering, engineering geology/engineering geophysics, and hydrology/hydrogeology are fields in which there appear to be more who practice those specialties than have degrees in those fields.

On the other hand, a degree in a particular specialty is not always translated directly into an employment specialty. More likely, academic training is the basis for training during employment. For all geoscientific specialties, the ratio of respondents' degree specialties to specialties practiced is slightly greater than 1.0.

d. Comparison of specialties held with specialties practiced

Table 8 shows the comparison between specialties held (primary and secondary specialties combined) and specialties currently practiced:

Table 8

Geoscientific Specialty Held and Specialty Practiced

	Specialties Held	Specialties Practiced	Coverage Ratio
Geology			
Atmospheric Science	45	12	3.8
Economic and Mining Geology	346	126	2.7
Environmental Geology	208	36	5.8
General Geology and Earth Science	419	34	12.3
Geochemistry	138	24	5.8
Geomorphology	71	11	6.4
Marine Geology/Marine Geophysics	173	41	4.2
Mathematical Geology/Geostatistics	89	10	8.9
Mineralogy	64	7	9.1
Oceanography	68	12	5.7
Paleontology and Palynology	28	10	2.8
Petroleum Geology	822	268	3.0
Petrology	100	18	5.5
Planetology	21	1	21.0
Remote Sensing	82	16	5.1
Sedimentology	108	11	9.9
Soil Science	69	1	69.0
Stratigraphy	201	9	22.3
Structural Geology and Tectonics	282	9	31.3
Volcanology	44	4	11.0
Subtotal	**3,378**	**660**	**5.1**
Geophysics			
Geophysics	646	295	2.2
Petroleum Geophysics	621	345	1.8
Subtotal	**1,267**	**640**	**2.0**
Petroleum Engineering	**1,011**	**720**	**1.4**
Mining Engineering	**246**	**93**	**2.6**
Engineering Geology and Engineering Geophysics	**525**	**230**	**2.3**
Hydrology and Hydrogeology	**248**	**69**	**3.6**
Total	**6,675**	**2,412**	**2.8**

The "coverage ratio" is the number of specialties held divided by the number of those currently working in that specialty. In almost every specialty category, there are more who are trained in a specialty than are working in that specialty. On the average (the mean), there are 2.8 qualified professionals for every professional specialty. The two specialties with the lowest coverage ratio - petroleum engineering (1.4) and petroleum geophysics (1.8) - are ranked first and fourth as the most frequently held specialties and first and second as the most frequently practiced specialties.

In spite of these coverage ratios, it would not be fair to conclude that there are too many geoscientists. Factors such as geographical preference, job rotation and training, and employment qualifications can affect the availability of personnel to fill vacancies.

e. Employer Category and General Specialty Practiced

Table 9 shows a cross-tabulation between employer category and general specialty currently practiced:

Table 9

Employer Category and General Specialty Practiced (as percentage of total geoscientific population)

	Geology, Geochemistry, Earth Science	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology
Academia	12.6	5.2	2.0	4.8	1.9	7.6
Government	18.8	9.3	2.6	17.9	37.3	33.3
Petroleum Industry	43.6	74.5	87.7	1.2	4.1	4.5
Mining/Minerals Industry	12.1	2.7	0.3	54.8	0.0	1.5
Engineering, Construction, and Consulting	4.7	1.8	1.3	11.9	50.5	45.5
Research and Related	2.9	2.8	0.4	0.0	2.8	3.0
Other Employers with Geoscientific Requirements	0.5	0.9	3.3	3.6	0.5	3.0
Employer with no Geoscientific Requirements	0.2	0.2	0.0	1.2	0.0	0.0
Not Employed	4.6	2.7	2.3	4.8	2.9	1.5
Total	**100.0**	**100.1**	**99.9**	**100.2**	**100.0**	**99.9**

It can be seen that the petroleum industry employs 43.6% of the geologists, geochemists, and other earth scientists, 74.5% of the geophysicists, and 87.7% of the petroleum engineers.

Government employs 18.8% of the geologists, geochemists, and other earth scientists, 37.3% of the engineering geologists, and 33.3% of the hydrologists/hydrogeologists.

Engineering, construction and geoscientific consulting companies employ 50.5% of the engineering geologists and 45.5% of the hydrologists/hydrogeologists.

f. Occupational Objective and Specialty Practiced

Table 10 shows a cross-tabulation between occupational objective and specialty practiced:

Table 10

Occupational Objective and Specialty Practiced (as percentage of total geoscientific population)[1]

	Geology, Geochemistry, Earth Science	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology
Finding and Developing Oil and Gas	46.5	80.3	89.7	1.1	4.0	3.0
Finding and Developing Other Resources	19.6	3.3	0.3	61.4	2.6	25.0
Geotechnical Applications	7.2	3.3	0.8	14.8	88.3	52.9
Public Policy Administration	3.2	0.3	1.7	6.8	1.3	4.4
Geoscientific Education, Basic Research and Communications	19.9	10.2	1.4	10.2	3.2	10.3
Other Geoscientific Applications	2.6	2.3	4.1	4.5	0.5	4.4
Non-geoscientific Related	1.1	0.2	1.9	1.1	0.0	0.0
Total	**100.1**	**99.9**	**99.9**	**99.9**	**99.9**	**100.0**

Finding and developing oil and gas is the occupational focus of 46.5% of the geologists, geochemists, and other earth scientists, 80.3% of the geophysicists, and 89.7% of the petroleum engineers.

Finding and developing other resources occupies 19.6% of the geologists, geochemists, and other earth scientists, 61.4% of the mining engineers, and 25.0% of the hydrologists/hydrogeologists.

Geotechnical applications are the occupational objective of 14.8% of the mining engineers, 88.3% of the engineering geologists, and 52.9% of the hydrologists/hydrogeologists.

Geoscientific education, basic research and communications occupy 19.9% of the geologists, geochemists, and other earth scientists, and 10.2% each of the geophysicists, mining engineers, and 10.3% of the hydrologists/hydrogeologists.

1 Percentages are exclusive of "Not Currently Employed" category.

3. Employment (Question IV)

a. Employer Category

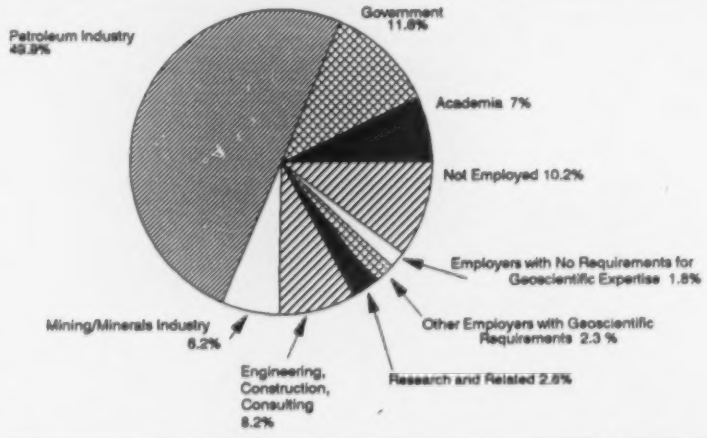
Table 11 and Figure A show the survey response for the 9 major categories of employers (including "not employed"):

Table 11

Current Employer Category (1986)	Number of Responses	% of Total
Academia	217	7.0
Government	358	11.6
Petroleum Industry	1,545	49.9
Mining/Minerals Industry	193	6.2
Engineering, Construction, Consulting	255	8.2
Research and Related	86	2.8
Other Employers with Geoscientific Requirements	71	2.3
Employers with No Requirements for Geoscientific Expertise	56	1.8
Not Employed	315	10.2
Total	**3,096**	**100.0**

Nearly half of the respondents are employed by the petroleum industry. Government employs the next largest percentage of the profession, followed by those in engineering, construction, and consulting.

Figure A
Current Employer Category


Petroleum Industry 49.9%
Government 11.6%
Academia 7%
Not Employed 10.2%
Employers with No Requirements for Geoscientific Expertise 1.8%
Other Employers with Geoscientific Requirements 2.3 %
Research and Related 2.8%
Engineering, Construction, Consulting 8.2%
Mining/Minerals Industry 6.2%

b. Employer Category (all subcategories)

Table 12 presents a complete breakdown of employer category and all subcategories:

Table 12

Current Employer Category (1986), with subcategories

	Number of Responses	% of Category	% of Total
Academia			
Secondary School	11	5.1	.4
Junior College/Technical	13	6.0	.4
College/University	194	88.9	6.2
Subtotal	**217**	**100.0**	**7.0**
Government			
Federal/National	256	71.5	8.3
State/Local	90	25.1	2.9
Military	11	3.1	.4
Other	1	.3	.0
Subtotal	**358**	**100.0**	**11.6**
Petroleum Industry			
Integrated Petroleum Company	633	41.0	20.4
Independent Exploration and Production Company	340	22.0	11.0
Drilling Contractor	14	0.9	.5
Oil Field Service	187	12.1	6.0
Consultant	294	19.0	9.5
Other	77	5.0	2.5
Subtotal	**1,545**	**100.0**	**49.9**
Mining or Minerals Industry			
Exploration and/or Producing Company	135	70.0	4.4
Consultant	50	26.0	1.6
Other	8	4.0	.2
Subtotal	**193**	**100.0**	**6.2**
Engineering, Construction, Consulting			
Construction and/or Engineering Firm	127	49.8	4.1
Geoscientific Studies Consultant	106	41.6	3.4
Other	22	8.6	.7
Subtotal	**255**	**100.0**	**8.2**
Research and Related			
Research Institute or Laboratory	55	64.0	1.8
Library	20	23.3	.7
Museum	4	4.7	.1
Other	7	8.0	.2
Subtotal	**86**	**100.0**	**2.8**

	Number of Responses	% of Category	U.S. Section % of Total
Other Employers with Geoscientific Requirements			
Banking/Financial	31	43.7	1.0
Equipment Manufacturers	19	26.8	.6
Law	4	5.6	.1
Journalism/Media	2	2.8	.1
Other	15	21.1	.5
Subtotal	**71**	**100.0**	**2.3**
Employers with No Requirements for Geoscientific Expertise			
By your choice	21	37.5	.7
By necessity, but want to return to geoscientific position	25	44.6	.8
By necessity, but do not want to return to geoscientific position	10	17.9	.3
Subtotal	**56**	**100.0**	**1.8**
Not Employed			
Retired	186	59.0	6.0
Unemployed, but want to return to geoscientific position	10	132.1	3.3
Unemployed, but do not want to return to geoscientific position	11	3.5	.4
Student	10	3.2	.3
Other	7	2.2	.2
Subtotal	**315**	**100.0**	**10.2**
Total	**3,096**		**100.0**

c. Not Employed

The survey response in this category shows that 6.0% are retired, and a total of 4.2% are unemployed. Most of the unemployed wish to return to geoscientific employment. For this category, the survey response appears at first glance to differ significantly from a 1986 survey published by the American Association of Petroleum Geologists (AAPG). In the AAPG survey, 25% of the AAPG members reported themselves as unemployed. The reasons for the differences between the AGI and AAPG figures include the following:

- The AGI survey presents information for the broad spectrum of all the geosciences, while the AAPG survey reflects data for a specific professional segment.
- The AAPG survey included in its definition of unemployed those who were unemployed or earning less than they did five years ago. To determine the number of underemployed in the AGI survey, age level and number of years of professional experience were compared to annual income. As an example, a geoscientist between the ages of 50 and 54, with 25 years of experience and whose reported annual income was less than $20,000, would certainly qualify as "underemployed."

To determine the underemployed percentage for the survey's AAPG population, cross-tabulations were run for each age level according to years of experience and annual income. Table 13 shows how the AAPG underemployed were identified:

Table 13

Underemployment for AAPG Membership

Age Level	Number Underemployed	Total in Category	% Underemployed	Criteria used for "underemployment"
25 - 29	7	64	10.9	< 5 years' experience @ 20K
				< 10 years' experience @ 30K
30 - 34	15	122	12.3	< 15 years' experience @ 30K
35 - 39	8	99	8.1	> 5 and < 20 years' experience @ 30K
40 - 44	2	44	4.5	> 5 years' experience @ 40K
45 - 49	5	43	11.6	> 5 years' experience @ 40K
50 - 54	7	55	12.7	> 19 years' experience @ 40K
55 - 59	12	68	17.6	> 19 years' experience @ 40K
60 - 64	18	55	32.7	> 25 years' experience @ 60K
65 - 69	12	29	41.4	> 30 years' experience @ 50K
69	13	25	52.0	> 30 years' experience @ 50K
Total	**99**	**604**	**16.4**	

The AAPG respondents were then tabulated according to employer category. Those who were in the "Not Employed" category (those who do and do not wish to return to geoscientific positions, and other) represented a total of 4.5%. Added to the underemployed percentage, the AGI survey showed a total of 20.9% of AAPG membership who are unemployed and underemployed. This total compares favorably with AAPG's report of nearly 25% of their members who were unemployed or whose 1986 income was "dramatically below what it was in 1981."

d. Comparison of Employer Category and Specialty Practiced

Table 14 shows a cross-tabulation between the major employer categories and specialty practiced:

Table 14

Employer Category and Specialty Practiced (as percentage of total geoscientists employed)

	Geology, Geochemistry, Other Earth Sciences	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology	Total
Academia	60.0	22.0	9.3	2.7	2.7	3.3	100.0
Government	40.3	18.3	5.6	4.6	24.5	6.8	100.1
Petroleum Industry	23.4	33.2	42.5	0.1	0.6	0.2	100.0
Mining/Minerals Industry	56.6	11.2	1.3	30.3	0.0	0.7	100.1
Engineering, Construction Consulting	24.1	5.0	4.1	4.5	48.6	13.6	99.9
Research and Related	44.2	34.6	5.8	0.0	11.5	3.8	99.9
Other Employers with Geoscientific Requirements	20.5	13.6	52.3	6.8	2.3	4.5	100.0
Employers with No Requirements for Geoscientific Expertise	95.1	2.4	0.0	2.4	0.0	0.0	99.9
Retired and Unemployed	83.3	6.4	6.1	1.5	2.3	0.4	100.0

- More than half of those geoscientists working in academia are geologists, geochemists, and other earth scientists.
- Of those geoscientists working in government, about one-quarter are engineering geologists.
- Of those geoscientists working in the mining/minerals industry, there are more geologists, geochemists, and other earth scientists (56.6%) than mining engineers (30.3%).
- Among those other employers with geoscientific requirements, slightly more than half (52.3%) of their employees are petroleum engineers.

4. Occupational Objective (Question VI)

a. Major Categories of Occupational Objective

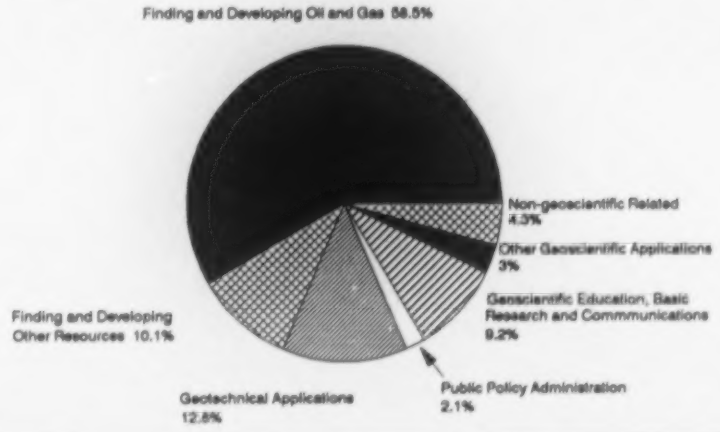
The major categories of occupational objective for the survey population are shown in Table 15 and Figure B:

Table 15

Occupational Objective	Number of Responses	% of Total
Finding and developing oil and gas	1,633	58.5
Finding and developing other resources	281	10.1
Geotechnical applications	358	12.8
Public policy administration	59	2.1
Geoscientific education, basic research and communications	256	9.2
Other geoscientific application	84	3.0
Non-geoscientific related	120	4.3
Total	**2,791**	**100.0**

Nearly 70% of the survey population is involved in finding and developing natural resources, especially oil and gas.

Figure B
Occupational Objective


Finding and Developing Oil and Gas 58.5%
Non-geoscientific Related 4.3%
Other Geoscientific Applications 3%
Geoscientific Education, Basic Research and Communications 9.2%
Public Policy Administration 2.1%
Geotechnical Applications 12.8%
Finding and Developing Other Resources 10.1%

b. Employer Category and Occupational Objective

Table 16 presents a cross-tabulation of major employer categories and occupational objective:

Table 16

Employer Category and Occupational Objective (as percentage of total geoscientists employed)

	Finding/ Developing Oil/Gas	Finding/ Developing Other Resources	Geo-technical Appli-cations	Public Policy Admin-istration	Education/ Research/ Commun-ications	Other	Non-Geoscientific	Total
Academia	11.3	3.1	3.8	0.0	76.7	0.0	5.0	99.9
Government	8.7	10.8	35.0	15.8	23.2	4.6	1.9	100.0
Petroleum Industry	94.7	0.5	0.4	0.1	0.6	1.6	2.0	99.9
Mining/Minerals Industry	3.9	89.6	2.6	0.0	0.0	1.3	2.6	100.0
Engineering, Construction Consulting	7.6	10.2	71.1	0.0	0.4	3.6	7.1	100.0
Research and related	17.3	1.9	25.0	3.8	36.5	13.5	1.9	99.9
Other employers with Geoscientific requirements	40.9	2.3	9.1	0.0	2.3	38.6	6.8	100.0
Employers with no Geoscientific Requirements	9.5	7.0	0.0	0.0	0.0	2.4	81.0	99.9

c. Employer Category and Detailed Occupational Focus

- For academia, 47.2% are involved in teaching, and 27.7% do basic research.
- Within government, 22.6% are involved in basic research, 18.6% focus on construction and civil development, and 15.8% are concerned with public policy administration.
- For the petroleum industry, 40.5% are involved in field development and production, 36.1% focus on exploration evaluation, and 11.3% work on seismic data acquisition and processing.
- For the mining/minerals industry, 55.2% are concerned with metals, 20.8% focus on industrial minerals and water, and 13.6% are involved with coal.
- Within engineering, construction and geoscientific consulting firms, 45.8% work in construction and civil development, 11.6% focus on hazard assessment, and 11.1% are involved with environmental and health investigations.
- Among those working in research and related employment, 32.7% work in basic research, 17.3% focus on oil and gas, and 13.5% are involved with environmental and health investigations.

5. Occupational Level (Question V)

a. Occupational level

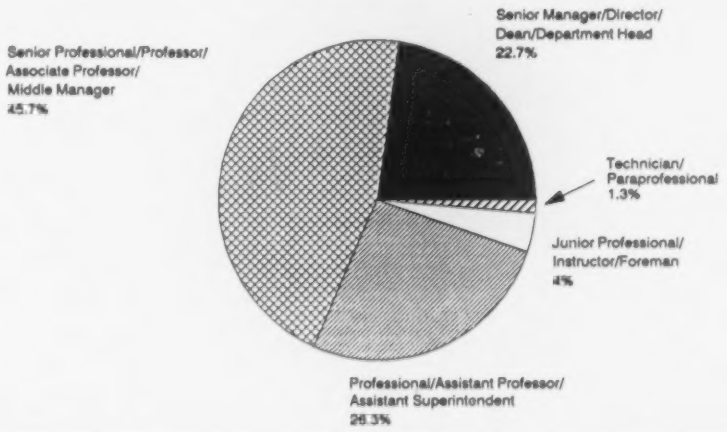
Table 17 and Figure C show the occupational levels for the total survey population:

Table 17

Occupational Level

	Number of Responses	% of Total
1) Senior Manager/Director/Dean/Department Head	605	22.7
2) Senior Professional/Professor/Associate Professor/ Middle Manager	1,221	45.7
3) Professional/Assistant Professor/Assistant Superintendent	702	26.3
4) Junior Professional/Instructor/Foreman	106	4.0
5) Technician/Paraprofessional	35	1.3
	2,669	100.0

Figure C
Occupational Level



Most respondents are in the middle to upper range of occupational levels. Nearly 70% of the total survey population hold positions at the senior professional level or above. That percentage is generally reflected for all employer categories and for all geoscientific specialties.

b. Employer Category and Occupational Level

Table 18 shows the general categories of employer and occupational levels:

Table 18

Employer Category and Occupational Level
(as percentage of total employer category)

	Occupational Level[1]					
Employer Category	**1**	**2**	**3**	**4**	**5**	**Total**
Academia	23.6	52.0	15.5	7.4	1.4	99.9
Government	8.8	61.3	25.9	3.8	0.3	100.1
Petroleum Industry	20.9	42.9	31.7	3.4	1.1	100.0
Mining/Minerals Industry	30.6	44.9	19.0	4.8	0.7	100.0
Engineering, Construction, Consulting	41.9	39.9	15.8	2.5	0.0	100.1
Research and Related	16.3	46.9	32.7	0.0	4.1	100.0
Other Employers with Geoscientific Requirements	33.3	47.6	19.0	0.0	0.0	99.9
Employers with No Geoscientific Requirements	20.0	40.0	15.0	10.0	15.0	100.0

- Of the geoscientists who work for the federal government 6.2% are at the top occupational level, while 16.7% of those working for state and local government are at that level.
- Of the geoscientists who work for integrated petroleum companies 4.2% are at the top occupational level, while 36.5% of those working for independent petroleum companies are at that level.
- The highest percentage of employed geoscientists at the top occupational level occurs among consultants involved with the petroleum industry - 54.1%; the next highest percentage occurs among consultants working for engineering, construction, and consulting firms - 47.6%.
- For the second highest occupational level, the highest concentration occurs among those working for the federal government - 64.5%, followed by those at colleges and universities (54.3%) and those working for state and local government (51.3%).

1 1) Senior Manager/Director/Dean/Department Head
2) Senior Professional/Professor/Associate Professor/Middle Manager
3) Professional/Assistant Professor/Assistant Superintendent
4) Junior Professional/Instructor/Foreman
5) Technician/Paraprofessional

c. Specialty Practiced and Occupational Level

Table 19 shows the general specialty-practiced categories and occupational levels:

Table 19

Specialty Practiced and Occupational Level (as percentage of total specialty practiced)

	Occupational Level[1]					
Specialty Practiced	**1**	**2**	**3**	**4**	**5**	**Total**
Geology, Geochemistry and Other Earth Science	27.5	48.4	20.9	2.3	1.0	100.1
Geophysics	12.3	52.0	32.4	2.5	0.8	100.0
Petroleum Engineering	22.4	39.9	31.6	5.0	1.0	99.9
Mining Engineering	23.8	42.5	27.5	6.3	0.0	100.1
Engineering Geology	29.3	46.0	21.4	3.3	0.0	100.0
Hydrology/Hydrogeology	11.5	60.7	23.0	3.3	1.6	100.1

- Engineering geologists show the highest percentage of those at the top occupational level (29.3%), followed by geologists, geochemists and other earth scientists (27.5%) and mining engineers (23.8%).
- At the second highest occupational level are hydrologists and hydrogeologists (60.7%), geophysicists (52.0%), and geologists, geochemists and other earth scientists (48.4%).
- For the top two occupational levels combined, geologists, geochemists and other earth scientists rank first (75.9%), followed by engineering geologists (75.3%) and hydrologists and hydrogeologists (72.2%).

1 1) Senior Manager/Director/Dean/Department Head
2) Senior Professional/Professor/Associate Professor/Middle Manager
3) Professional/Assistant Professor/Assistant Superintendent
4) Junior Professional/Instructor/Foreman
5) Technician/Paraprofessional

6. Age (Question IV)

a. Age Distribution for Total Geoscience Population

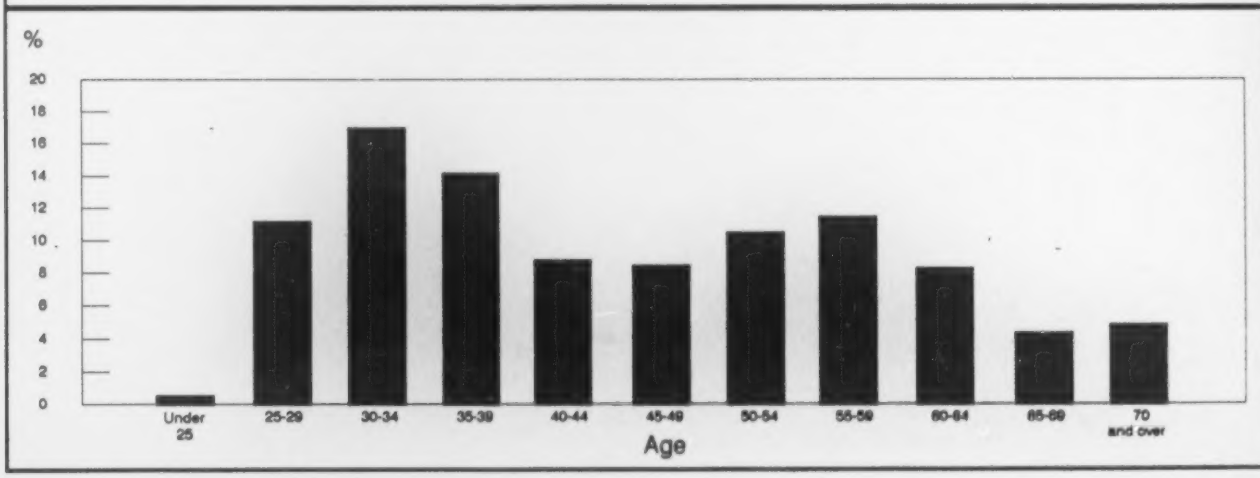
Age distribution within the geoscience population is one of the most consequential factors for determining employment trends. Table 20 and Figure D summarize the age distribution for the survey population:

Table 20

Age Distribution

Age	Number of Responses	% of Total
Under 25	17	0.6
25 - 29	324	11.2
30 - 34	494	17.0
35 - 39	413	14.2
40 - 44	256	8.8
45 - 49	248	8.5
50 - 54	305	10.5
55 - 59	334	11.5
60 - 64	241	8.3
65 - 69	127	4.4
70 and over	142	4.9
Total	**2,901**	**99.9**

Figure D
Age Distribution



Two age concentrations occur with peaks at ages 30-34 (17.0%) and 55-59 (11.5%). To determine the relative accuracy of this age distribution, data from the graduate survey were compared to the principal survey's data. Table 21 presents the comparison:

Table 21

Comparison of Age Distribution
Principal and Graduate Surveys

Age	Principal Survey %	Graduate Survey %
Under 25	0.6	4.2
25 - 29	11.2	14.0
30 - 34	17.0	17.8
35 - 39	14.2	14.4
40 - 44	8.8	7.2
45 - 49	8.5	7.5
50 - 54	10.5	9.9
55 - 59	11.5	8.7
60 - 64	8.3	8.0
65 - 69	4.4	4.5
70 and over	4.9	3.8
Median Age	**44**	**40**

Like the age distribution for the principal survey population, that for the graduate survey population is also bimodal. The first peak for both populations occurs at ages 30-34, while the second peak for the graduate survey population occurs at one age interval younger (50-54). One explanation for this slight discrepancy at the older age level would be to assume that membership in professional societies inherently suggests an older population. Since most professional societies require some minimum employment/experience credentials, acquiring those qualifications probably delays the threshhold age of membership.

Since the survey population for the principal survey probably was derived from professional society membership lists, it seems likely that the age distribution would reflect a somewhat older population. The graduate survey population, on the other hand, was derived from sources independent of professional society membership. Therefore, there is a larger percentage of those in the categories of under 25 through age 39.

If the age distributions for both surveys are compared to the age distribution for the total U.S. labor force, there is general agreement at least for somewhat larger age groupings:

Age	Principal Survey %	Graduate Survey %	Total U.S. Labor Force %[1]
25-54	70.2	70.8	67.5
55 and over	29.1	25.0	12.7

This comparison also shows that there are roughly twice as many geoscientists age 55 and over as there are in the total U.S. labor force of the same age. That ratio is a reflection of the generally longer careers for professional employment when compared to total employment (skilled and unskilled combined).

When age categories are cumulatively combined, a more general interpretation of the age distribution is possible. Table 22 presents a few of these combinations:

1 Figures from U.S. Department of Labor

Table 22

Age Distribution in Cumulative Combinations (percentages combined)

Age	% less than	% more than
25	0.6	99.4
30	1.8	88.2
35	18.8	81.2
40	43.0	57.0
45	51.8	48.2
50	60.3	39.7
55	70.8	29.2
60	82.3	17.7
65	90.6	9.4
70	95.1	4.9

b. Age Distribution and Employer Category

Within employer categories, the age distribution varies widely, as shown in Table 23:

Table 23

Age Distribution and Employer Category (as percentage of employer categories)

	Age		
Employer Category	**% Under 35**	**% 35-49**	**% 50 & Over**
Academia	12.5	38.1	49.4
Government	15.2	38.4	46.4
Petroleum Industry	38.7	31.0	30.3
Mining/Minerals Industry	22.1	39.6	38.3
Engineering, Construction, Consulting	19.7	37.0	43.3
Research and Related	24.0	46.0	30.0
Other Employers with Geoscientific Requirements	27.3	36.4	36.3
Employers with No Geoscientific Requirements	35.7	38.1	26.2
Not Employed	16.5	13.6	69.9
Population Total[1]	**28.8**	**31.6**	**39.6**

Academia has an older population with nearly 50% being age 50 and over, and nearly 13% under age 35. Government employees reflect somewhat the same distribution.

Petroleum companies, however, have a younger population, with 30.3% being age 50 and over, and 38.7% under age 35.

Research and related employment shows the largest percentage in the age group 35-49 (46.0%).

Within the petroleum industry, there are marked differences, particularly between the integrated companies, the independent companies, and consultants, as shown in Table 24:

1 The terms "population total" and "total population" refer to the survey's geoscience population.

Table 24

Age Distribution in the Petroleum Industry
(as percentage of employer category)

	Age		
	% Under 35	% 35-49	% 50 & Over
Integrated companies	51.5	30.6	17.9
Independent companies	35.1	34.0	30.9
Drilling Contractor/Oil field service	37.0	37.5	25.5
Consultants	14.0	24.2	61.8
Other	43.6	28.2	28.2
Total Population	**38.7**	**31.0**	**30.3**

c. Age Distribution and Occupational Category

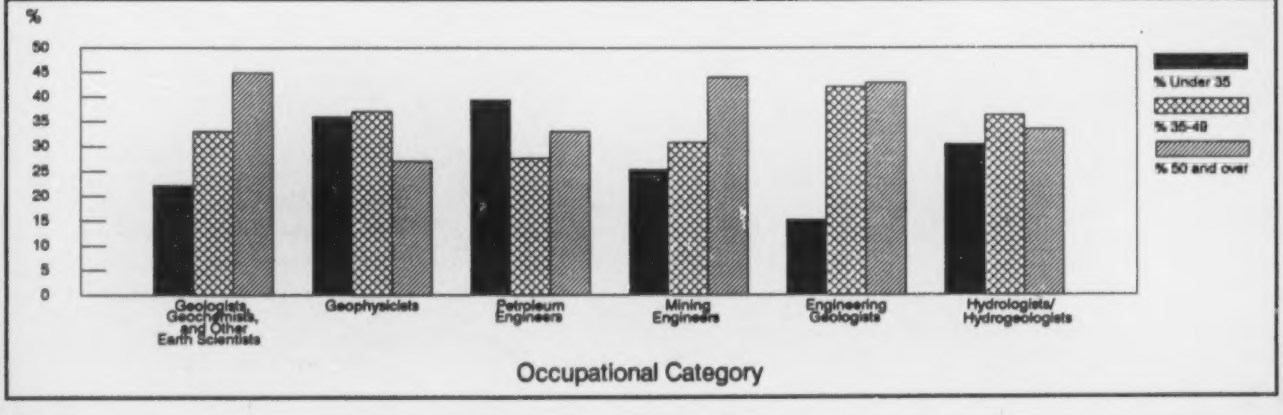
The age distribution for occupational categories is shown in Table 25 and Figure E:

Table 25

Age Distribution and Occupational Category
(as percentage of occupational categories)

	Age		
Occupational Category	% Under 35	% 35-49	% 50 & Over
Geologists, Geochemists, and Other Earth Scientists	22.1	33.0	44.9
Geophysicists	36.0	37.1	26.9
Petroleum Engineers	39.4	27.6	33.0
Mining Engineers	25.3	30.8	44.0
Engineering Geologists	15.1	42.0	42.9
Hydrologists/Hydrogeologists	30.4	36.2	33.4
Total Population	**30.7**	**33.3**	**36.0**

Figure E
Age Distribution and Occupational Category



Engineering geologists are the oldest group, with 15.1% under the age of 35 and 42.9% being age 50 and over. Geophysicists are the youngest group with 36.0% under the age of 35 and 26.9% being age 50 and over. Petroleum engineers show the most pronounced bimodal age distribution.

7. Years of Experience (Question VII)

a. Years of Experience for Total Geoscience Population

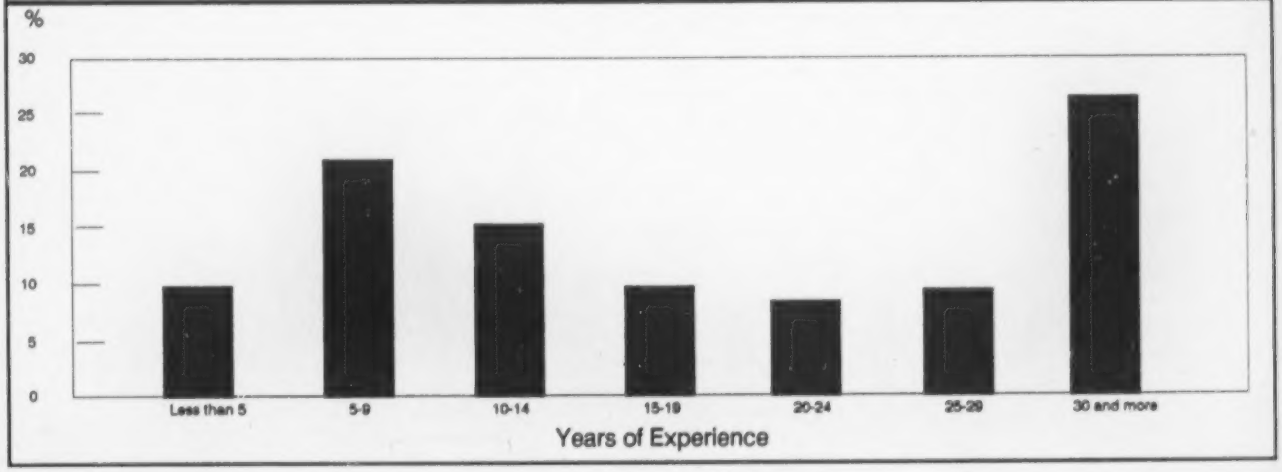
For the total geoscience population, the years of experience are shown in Table 26 and Figure F:

Table 26

Years of Experience

	Number of Responses	% of Total
Less than 5	282	9.8
5 - 9	607	21.0
10 - 14	441	15.3
15 - 19	280	9.7
20 - 24	241	8.4
25 - 29	270	9.4
30 and more	763	26.4
Total	**2,884**	**100.0**

Figure F
Years of Experience



The years of experience pattern reflects the bimodal age distribution noted above. The heaviest concentrations occur among those who have been working for 5-9 years (21.0%) and those who have been working for 30 years or more (26.4%). Nearly half of the total population (46.1%) have worked for 14 years or less and more than one-quarter have worked for 30 years or more.

b. Years of Experience and Employer Category

The years of experience pattern varies widely within the different categories of employer. Table 27 shows the years of experience according to three groupings of years of experience:

Table 27

Years of Experience and Employer Category (as percentage of employer categories)

Employer Category	Years of Experience: % Less than 5	% 5 - 14	% 15 and more
Academia	10.2	22.3	67.5
Government	3.1	29.7	67.2
Petroleum Industry	12.0	44.3	43.7
Mining/Minerals Industry	2.0	38.6	59.4
Engineering, Construction, Consulting	7.9	32.0	60.1
Research and Related	11.5	34.6	53.9
Other Employers with Geoscientific Requirements	2.3	40.9	56.8
Employers with No Geoscientific Requirements	47.5	32.5	20.0
Not Employed	8.9	18.5	72.6
Total Population	**10.0**	**37.0**	**53.0**

Among geoscientific employers, academia, the petroleum industry, and research and related employers show 10-12% of their employees with less than 5 years' experience. Government, the mining/minerals industry, and other employers with geoscientific requirements employ relatively few inexperienced personnel. Employers with no geoscientific requirements employ a very large number (47.5%) of personnel with less than 5 years' experience. That figure may reflect the difficulty in recent years for new geoscientists to find sustained employment in the profession.

c. Years of Experience and Occupational Category

Table 28 shows the years of experience for three groupings of years of experience and occupational category:

Table 28

Years of Experience and Occupational Category (as percentage of total occupational categories)

Occupational Category	Years of Experience: % Less than 5	% 5 - 14	% 15 and more
Geologists, Geochemists, and other Earth Scientists	5.5	33.1	61.4
Geophysicists	9.9	45.2	44.9
Petroleum Engineers	14.0	39.6	46.4
Mining Engineers	2.2	36.7	61.1
Engineering Geologists	2.6	32.0	65.4
Hydrologists/Hydrogeologists	2.9	44.9	52.2
Total Population	**8.7**	**38.8**	**52.5**

Geophysicists and petroleum engineers have the highest proportion of those with less than 5 years' experience. Geologists, geochemists, and other earth scientists (61.4%) and engineering geologists (65.4%) show the highest proportion that has worked for 15 years or more.

8. Number of Companies/Institutions Worked For (Question VIII)

a. Number of Companies/Institutions Worked For - For Total Geoscience Population

As a measure of the mobility of the geoscience population, respondents were asked to indicate the number of companies or institutions for which they have worked. Table 29 and Figure G show the breakdown for the total geoscience population:

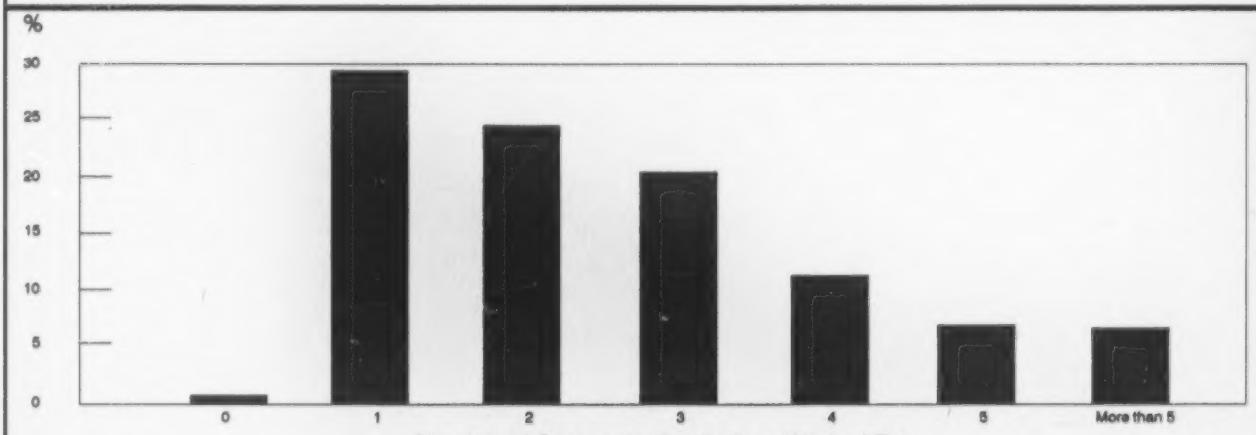
Table 29

Number of Companies/Institutions Worked For

	Number of Responses	% of Total
0	20	0.7
1	852	29.5
2	710	24.6
3	592	20.5
4	325	11.3
5	199	6.9
More than 5	191	6.6
Total	**2,889**	**100.0**

More than half of the survey population has worked for only one or two companies/institutions, and nearly 75% of the total has worked for no more than three.

Figure G
Number of Companies/Institutions Worked For



b. Number of Companies/Institutions Worked For and Employer Category

Table 30 shows the number of companies/institutions worked for and employer category. Those who indicated working for no companies were removed from the total:

Table 30

Number of Companies/Institutions Worked For and Employer Category (as percentage of total employer categories)

	1	2	3	4	5	More than 5	Total
Academia	23.0	25.7	27.6	11.8	5.3	6.6	100.0
Government	28.8	26.7	21.8	10.4	5.8	6.4	99.9
Petroleum Industry	34.6	24.6	18.9	10.8	6.5	4.6	100.0
Mining/Minerals Industry	26.8	23.5	18.3	13.7	5.9	11.8	100.0
Engineering, Construction, Consulting	15.9	22.6	28.8	14.6	8.4	9.7	100.0
Research and Related	33.3	21.6	25.5	11.8	7.8	0.0	100.0
Other Employers with Geoscientific Requirements	13.6	36.4	15.9	22.7	6.8	4.5	99.9
Employers with No Geoscientific Requirements	29.2	17.1	24.4	7.3	12.2	9.8	100.0
Not Employed	24.9	24.5	20.0	9.8	9.1	11.7	100.0
Population Total	**29.8**	**24.7**	**20.8**	**11.4**	**6.9**	**6.5**	**100.1**

Geoscientists working for the petroleum industry have worked for the fewest employers, followed by those in research and related employers. Those working for other employers with geoscientific requirements are the most mobile, with 34.0% working for 4 or more companies/institutions. The next most mobile category is engineering, construction, and consulting (32.7%), followed by those in the mining/minerals industry (31.4%).

As an example of the variations within employer categories, for the petroleum industry 53% of those employed by the integrated petroleum companies have worked for only one company, while only 10% have worked for 4 or more companies. On the other hand, 15% of those working for independent petroleum companies have worked for only one company, while 33% have worked for 4 or more. Among petroleum consultants, 11% have worked for only one company, while 40% have worked for 4 or more.

c. Number of Companies/Institutions Worked For and Occupational Category

Table 31 cross-tabulates the number of companies/institutions worked for and occupational category. Those who indicated working for no companies/institutions were removed from the total:

Table 31

Number of Companies/Institutions Worked For and Occupational Category (as percentage of total occupational categories)

	1	2	3	4	5	More than 5	Total
Geologists, Geochemists, and Other Earth Scientists	23.2	27.5	22.6	12.9	6.5	7.2	99.9
Geophysicists	33.2	24.1	22.7	10.1	5.8	4.0	99.9
Petroleum Engineers	36.9	22.7	16.5	11.7	6.6	5.5	99.9
Mining Engineers	28.1	16.9	18.0	18.0	6.7	12.4	100.1
Engineering Geologists	25.2	23.9	22.1	10.6	8.8	9.3	99.9
Hydrologists/Hydrogeologists	11.6	30.4	30.4	15.9	10.1	1.5	99.9
Population Total	**30.1**	**24.5**	**20.8**	**11.9**	**6.7**	**6.1**	**100.1**

Mining engineers are the most mobile, with 37.1% having worked for 4 or more companies, followed by engineering geologists at 28.7%. Geophysicists and petroleum engineers are the least mobile with 19.9% and 23.8% respectively having worked for 4 or more companies.

9. Income (Question IX)

a. Annual Income for Total Geoscience Population

Total annual income for the total survey population is shown in Table 32 and Figure H:

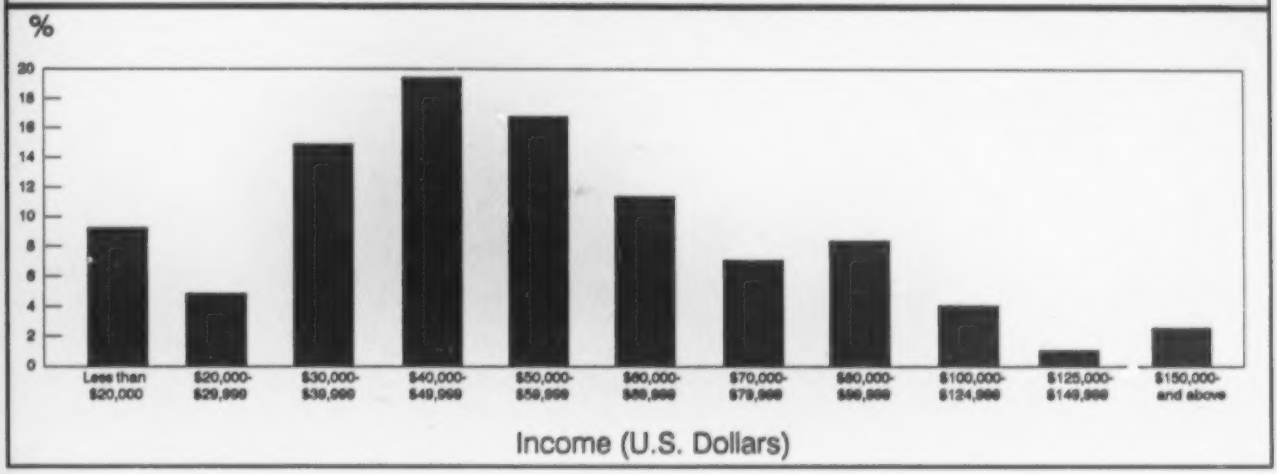
Table 32

Total Current Annual Employment Income (U.S. Dollars)

	Number of Responses	% of Total
Less than $20,000	254	9.3
$20,000 - $29,999	134	4.9
$30,000 - $39,999	407	14.9
$40,000 - $49,999	531	19.4
$50,000 - $59,999	460	16.8
$60,000 - $69,999	313	11.4
$70,000 - $79,999	193	7.1
$80,000 - $99,999	230	8.4
$100,000 - $124,999	111	4.1
$125,000 - $149,999	31	1.1
$150,000 and above	72	2.6
Total	**2,736**	**100.0**

The median annual income for the total survey population was approximately $51,000.

Figure H
Total Current Annual Employment Income



b. Annual Income and Employer Category

Table 33 shows the approximate median annual income for the major categories of employer:

Table 33

Approximate Median Annual Employment Income and Employer Category

	Approximate Median
Academia	$49,000
Government	$44,000
Petroleum Industry	$56,000
Mining/Minerals Industry	$45,000
Engineering, Construction, Consulting	$51,000
Research and Related	$51,000
Other Employers with Geoscientific Requirements	$63,000
Employers with No Geoscientific Requirements	< $20,000
Not Employed	< $20,000
Population Total	**$51,000**

The highest approximate median income is earned by those working for other employers with geoscientific requirements, a category that comprises only 2.3% of the total geoscientific population.

Within employer categories there are some interesting variations:

- The federal government pays more than state/local government; for federal geoscientists, 52.3% earn between $40,000 and $60,000, while for state/local geoscientists, the corresponding percentage is 39%.
- Within the petroleum industry, the median salary for those working for integrated petroleum companies is $55,000, while for independent petroleum companies, the median income is $63,000.

c. Annual Income and Occupational Category

Table 34 shows the approximate median annual income for the major occupational categories:

Table 34

Approximate Median Annual Employment Income and Occupational Category

	Approximate Median
Geologists, Geochemists, and other Earth Scientists	$50,000
Geophysicists	$53,000
Petroleum Engineers	$56,000
Mining Engineers	$47,000
Engineering Geologists	$45,000
Hydrologists/Hydrogeologists	$47,000
Median	**$51,000**

10. Primary Work Location (Question XI)

a. Primary Work Location for Total Geoscience Population

Table 35 and Figure I show the primary work location for the total survey population:

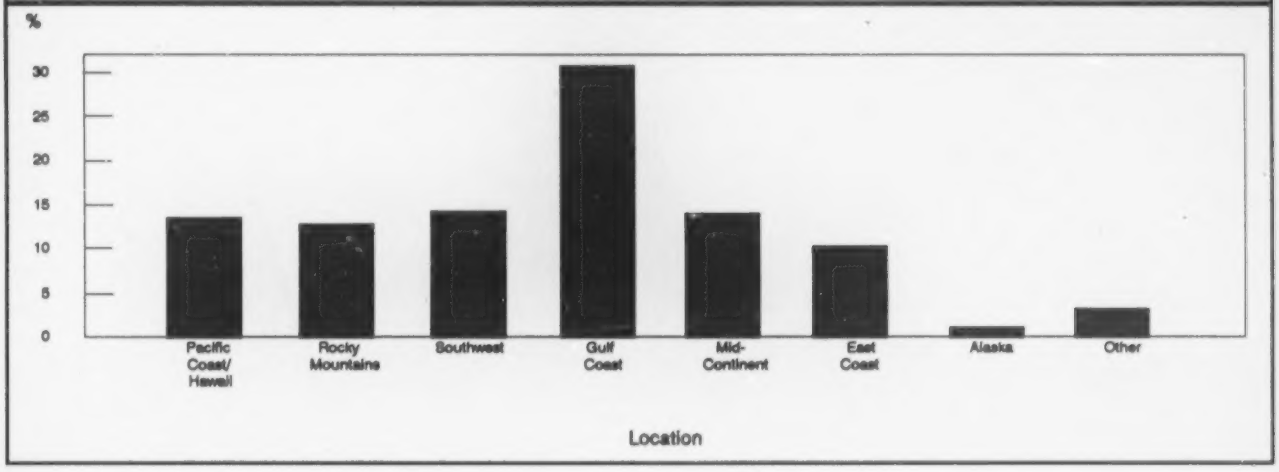
Table 35

Primary Work Location

	Number of Responses	% of Total
Pacific Coast/Hawaii	360	13.5
Rocky Mountains	339	12.8
Southwest	381	14.3
Gulf Coast	819	30.8
Mid-Continent	372	14.0
East Coast	273	10.3
Alaska	29	1.1
Total	**2,573**	**96.8**
Other (includes Canada, Central & South America, overseas)	85	3.2
Total	**2,658**	**100.0**

With the exception of the Gulf Coast and Alaska, the survey population is about equally distributed in the U.S. The Gulf Coast region has about twice as many geoscientists as any of the other regions.

Figure I
Primary Work Location



b. Primary Work Location and Employer Category

Table 36 shows the primary work location for the major employer categories:

Table 36

Primary Work Location and Employer Category
(as percentage of total employer categories)

	Pacific Coast	Rocky Mountains	South-west	Gulf Coast	Mid-Continent	East Coast	Alaska	Other	Total
Academia	20.9	5.2	6.5	19.0	17.6	26.8	0.7	3.3	100.0
Government	24.3	26.5	8.0	8.6	6.7	21.1	3.2	1.6	100.0
Petroleum Industry	6.5	8.9	16.0	46.2	15.3	2.9	0.9	3.3	100.0
Mining/Minerals Industry	5.3	30.1	21.8	9.0	15.0	15.8	1.5	1.5	100.0
Engineering, Construction, Consulting	41.0	10.5	7.6	10.0	10.5	18.1	0.0	2.4	100.1
Research and Related	22.0	16.0	20.0	0.0	12.0	26.0	2.0	2.0	100.0
Other Employers with Geoscientific Requirements	10.0	0.0	32.5	20.0	20.0	17.5	0.0	0.0	100.0
Employers with No Geoscientific Requirements	25.0	17.5	17.5	5.0	10.0	22.5	0.0	2.5	100.0
Not Employed	12.2	14.6	16.0	26.8	15.5	6.6	1.4	7.0	100.1

The most populous regions for each employer category are as follows:

Academia	East Coast
Government	Rocky Mountains
Petroleum Industry	Gulf Coast
Mining/Minerals Industry	Rocky Mountains
Engineering, Construction Consulting	Pacific Coast/Hawaii
Research and related	East Coast
Other employers with Geoscientific requirements	Southwest
Employers with no Geoscientific Requirements	Pacific Coast/Hawaii
Not Employed	Gulf Coast

c. Primary Work Location and Occupational Category

Table 37 shows the primary work location for the major occupational categories:

Table 37

Primary Work Location and Occupational Category (as percentage of occupational categories)

	Pacific Coast	Rocky Mountains	South-west	Gulf Coast	Mid-Continent	East Coast	Alaska	Other	Total
Geologists, Geochemists and Other Earth Scientists	15.1	16.3	10.5	22.3	15.8	15.0	1.9	3.1	100.0
Geophysicists	7.7	12.5	14.8	43.8	10.3	4.5	1.9	4.5	100.0
Petroleum Engineers	9.4	7.8	17.8	41.8	16.9	4.1	0.3	1.9	100.0
Mining Engineers	11.9	33.3	9.5	6.0	11.9	26.2	1.2	0.0	100.0
Engineering Geologists	41.8	15.5	9.4	5.2	10.8	16.0	0.5	0.9	100.1
Hydrologists/ Hydrogeologists	28.4	9.0	6.0	10.4	11.9	31.3	0.0	3.0	100.0

The Gulf Coast is the most populous primary work location for three occupational categories: 1)geologists, geochemists, and other earth scientists, 2) geophysicists, and 3) petroleum engineers. Mining engineers are most concentrated in the Rocky Mountains, engineering geologists on the Pacific Coast/Hawaii, and hydrologists/hydrogeologists on the East Coast.

11. Race/Ethnic Origin (Question XII)

a. Race/Ethnic Origin for Total Geoscience Population

Table 38 shows the race/ethnic origin for the total survey population:

Table 38

Race/Ethnic Origin

	Number of Respondents	% of Total
American Indian/Alaskan Native	28	1.0
Arab	11	0.4
Black	11	0.4
Caucasian	2,682	95.4
Hispanic	27	1.0
Asian/Pacific Islander	50	1.8
Total	**2,809**	**100.0**

b. Race/Ethnic Origin and Employer Category

Table 39 shows the race/ethnic origin for the major employer categories:

Table 39

Race/Ethnic Origin and Employer Category (as percentage of employer categories)

	Caucasian	Non-Caucasian
Academia	92.3	7.7
Government	96.8	3.2
Petroleum Industry	94.8	5.2
Mining/Minerals Industry	97.3	2.7
Engineering, Construction, Consulting	95.4	4.6
Research and Related	96.0	4.0
Other Employers with Geoscientific Requirements	97.7	2.3
Employers with No Geoscientific Requirements	95.1	4.9
Not Employed	97.0	3.0
Population Total	**95.4**	**4.6**

c. Race/Ethnic Origin and Occupational Category

Table 40 shows the race/ethnic origin for the major occupational categories:

Table 40

Race/Ethnic Origin and Occupational Category (as percentage of occupational categories)

	Caucasian	Non-Caucasian
Geologists, Geochemists, and other Earth Scientists	96.9	3.1
Geophysicists	94.4	5.6
Petroleum Engineers	95.0	5.0
Mining Engineers	94.5	5.5
Engineering Geologists	95.9	4.1
Hydrologists/Hydrogeologists	96.7	3.3

12. Gender (Question XV)

a. Gender for Total Survey Population

For the total survey population responding to this question, 94.8% are male, 5.2% are female (total number = 2,883).

b. Gender and Employer Category

Table 41 shows the gender percentages for the major employer categories:

Table 41

Gender and Employer Category (as percentage of employer categories)

	Male	Female
Academia	94.3	5.7
Government	94.8	5.2
Petroleum Industry	95.2	4.8
Mining/Minerals Industry	96.0	4.0
Engineering, Construction, Consulting	95.2	4.8
Research and Related	86.0	14.0
Other Employers with Geoscientific Requirements	93.2	6.8
Employers with No Geoscientific Requirements	81.0	19.0
Not Employed	94.8	5.2
Total Population	**95.0**	**5.0**

c. Gender and Occupational Category

Table 42 shows the gender percentages for occupational categories:

Table 42

Gender and Occupational Category
(as percentage of occupational categories)

	Male	Female
Geologists, Geochemists, and other Earth Scientists	95.6	4.4
Geophysicists	93.9	6.1
Petroleum Engineers	95.5	4.5
Mining Engineers	97.8	2.2
Engineering Geologists	95.2	4.8
Hydrologists/Hydrogeologists	89.7	10.3

13. Citizenship (Question XVI)

a. Citizenship for Total Survey Population

For the total survey population, 97.3% are U.S. citizens, 1.0% are Canadians, and 1.7% are Other.

b. Citizenship and Employer Category

Table 43 shows citizenship and major employer categories:

Table 43

Citizenship and Employer Category
(as percentage of employer categories)

	U.S.	Canada	Other
Academia	91.1	3.2	5.7
Government	100.0	0.0	0.0
Petroleum Industry	97.0	1.2	1.8
Mining/Minerals Industry	96.8	1.9	1.3
Engineering, Construction, Consulting	98.7	0.0	1.3
Research and Related	98.0	0.0	2.0
Other Employers with Geoscientific Requirements	90.9	2.3	6.8
Employers with No Geoscientific Requirements	100.0	0.0	0.0
Not Employed	98.5	0.4	1.1
Population Total	**97.3**	**1.0**	**1.7**

c. Citizenship and Occupational Category

Table 44 shows citizenship and major occupational categories:

Table 44

Citizenship and Occupational Category (as percentage of occupational categories)

	U.S.	Canada	Other
Geologists, Geochemists, and other Earth Scientists	97.5	0.9	1.6
Geophysicists	94.7	1.6	3.7
Petroleum Engineers	97.6	1.0	1.4
Mining Engineers	98.9	1.1	0.0
Engineering Geologists	100.0	0.0	0.0
Hydrologists/Hydrogeologists	100.0	0.0	0.0

14. Professional Society Membership (Question X)

Table 45 shows the total survey response to the question about membership in professional societies. Since respondents were asked to mark all of the societies to which they belonged, the 3,026 respondents indicated a total of 5,415 memberships.

Table 45

Professional Society Membership

	Number of Responses	% of Responses
American Association for the Advancement of Science	185	3.4
American Association of Petroleum Geologists	645	11.7
American Association of Stratigraphic Palynologists	1	0.0
American Chemical Society	33	0.6
American Geophysical Union	260	4.7
American Institute of Physics	27	0.5
American Institute of Professional Geologists	184	3.3
American Society for Photogrammetry and Remote Sensing	25	0.5
Association for Women Geoscientists	18	0.3
Association of American State Geologists	3	0.1
Association of Earth Science Editors	7	0.1
Association of Engineering Geologists	316	5.7
Canadian Society of Exploration Geophysicists	17	0.3
Canadian Geophysical Union	0	0.0
Geochemical Society	23	0.4
Geological Association of Canada	12	0.2
Geological Society of America	368	6.7
Geoscience Information Society	3	0.1
Mineralogical Society of America	37	0.7
Mineralogical Society of Canada	12	0.2
National Association of Geology Teachers	19	0.3
Paleontological Society	10	0.2
Seismological Society of America	64	1.2
Society of Economic Geologists	91	1.7
Society of Economic Paleontologists and Mineralogists	107	1.9
Society of Exploration Geophysicists	882	16.0
Society of Independent Professional Earth Scientists	30	0.5
Society of Mining Engineers	362	6.6
Society of Petroleum Engineers of AIME	1,096	19.9
Society of Professional Well Log Analysts	152	2.8
Society of Vertebrate Paleontology	3	0.1
Other	423	7.7
None	94	1.7
Total	**5,509**	**100.1**

The survey population averaged 1.8 memberships each. Of the respondents, 1.7% belong to no professional society, 46% belong to only one society, 39% belong to 2 or 3 societies, and 13% belong to more than 3 societies.

C. Additional Analyses

Two specific populations were analyzed to demonstrate how particular segments of the population can be extracted for examination and to review groups of particular interest. A complete analysis for each population will not be given. Rather, selected highlights will be presented where there are significant differences from the general geoscience population.

1. Academic Population

The academic population represents 7.0% of the total geoscience population. Within this group, 88.9% are employed at the college/university level, 6.0% at the junior college/technical school level, and 5.1% at the secondary school level.

a. Geoscientific Specialty Held

Within the 26 geoscientific specialties for which information was obtained, Table 46 shows the most frequent primary specialties for the academic population:

Table 46

Geoscientific Specialty for Academic Population
Selected Data

	Number of Responses	% of Total	
Geophysics	36	17.6	
Petroleum Engineering	30	14.7	
Engineering Geology and Engineering Geophysics	16	7.8	
Economic and Mining Geology	14	6.9	
Marine Geology	10	4.9	
Petroleum Geology	10	4.9	
Geochemistry	9	4.4	
General Geology and Earth Science	8	3.9	
Petrology	8	3.9	
Hydrology	7	3.4	
Stratigraphy	7	3.4	
Total	**155**	**75.8**	**N = 204**

b. Geoscientific Specialty Practiced

In response to the question on specialty currently practiced, the most frequently practiced specialties are shown in Table 47:

Table 47

Geoscientific Specialty Practiced for Academic Population
Selected Data

	Number of Responses	% of Total
Geophysics	30	16.4
Petroleum Engineering	29	15.9
Engineering Geology and Engineering Geophysics	14	7.7
Economic and Mining Geology	13	7.1
Geochemistry	9	4.9
Petrology	9	4.9
Marine Geology	8	4.4
General Geology and Earth Science	6	3.3

	Number of Responses	% of Total	
Hydrology	6	3.3	
Mining Engineering	6	3.3	
Paleontology	6	3.3	
Petroleum Geology	6	3.3	
Stratigraphy	6	3.3	
Total	**148**	**81.1**	**N = 183**

c. Occupational Level

For the occupational level, Table 48 shows the relative frequencies and percentages for the academic population:

Table 48

Occupational Level for Academic Population

	Number of Responses	% of Total
Department Head/Dean	47	24.0
Full Professor/Associate Professor	94	48.0
Assistant Professor	37	18.9
Instructor	15	7.7
Other	3	1.4
	196	**100.0**

To test these percentages for occupational level, the relative percentages for each occupational level were compared to those in the 1986 *Directory of Geoscience Departments.* Table 49 compares the percentages from the survey population and those from the *Directory:*

Table 49

Comparison of Occupational Level Percentages for Survey Academic Population and *Directory* Academic Population

	Survey Percentage	*Directory* Percentage
Department Head/Dean	24.0	11.9
Full Professor/Associate Professor	48.0	42.5
Assistant Professor	18.9	23.0
Instructor	7.7	19.1
Other	1.5	3.5
	100.1	**100.0**

It is evident that the survey sample of those in academia is somewhat biased toward the upper occupational levels. One reason for this discrepancy is that the survey sample includes secondary school teachers, whose "ranks" do not always conform to standard college/university academic categorizations. In all likelihood, those teaching at the secondary-school level would characterize themselves at the department-head or full-/associate-professor level. The *Directory* is limited to college/university faculty only, where ranks more strictly conform to the questionnaire's categories.

It is also likely that the survey sample favors a slightly older population, as was discussed earlier. Since rank is generally linked to years of experience, some bias toward the higher ranks would be expected. The following discussion concerning age also shows that the academic population is "older" than the survey sample as a whole.

d. Age

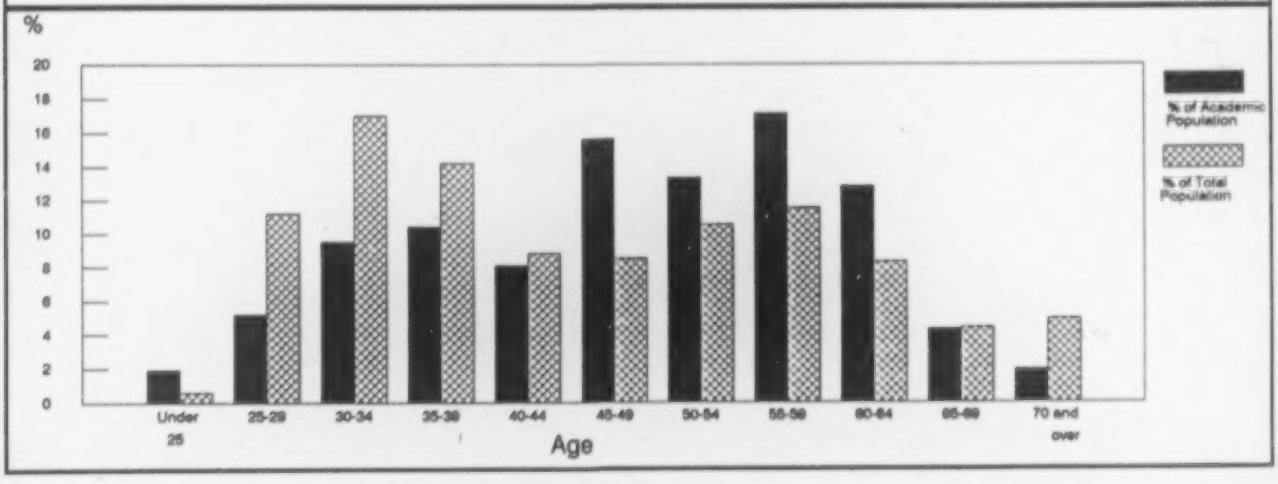
The age of the academic population is bimodal as is the total population. However, the pattern of distribution is nearly reversed, with the largest percentage of the academic population being in the group 55-59 years of age, while the largest category in the total population is in the group 30-34 years of age. Table 50 and Figure J show the comparison between the academic population and the total population in percentages at the various age groups:

Table 50

Age Distribution for Academic and Total Population

	% of Academic Population	% of Total Population
Under 25	1.9	0.6
25 - 29	5.2	11.2
30 - 34	9.5	17.0
35 - 39	10.4	14.2
40 - 44	8.1	8.8
45 - 49	15.6	8.5
50 - 54	13.3	10.5
55 - 59	17.1	11.5
60 - 64	12.8	8.3
65 - 69	4.3	4.4
70 and over	1.9	4.9
Total	**100.1**	**99.9**

Figure J
Age Distribution for Academic and Total Population



e. Years of Experience

For years of experience, the academic population shows the same general pattern as the total population but differs in rankings and concentrations. Table 51 compares the years of experience for the academic and total populations:

Table 51

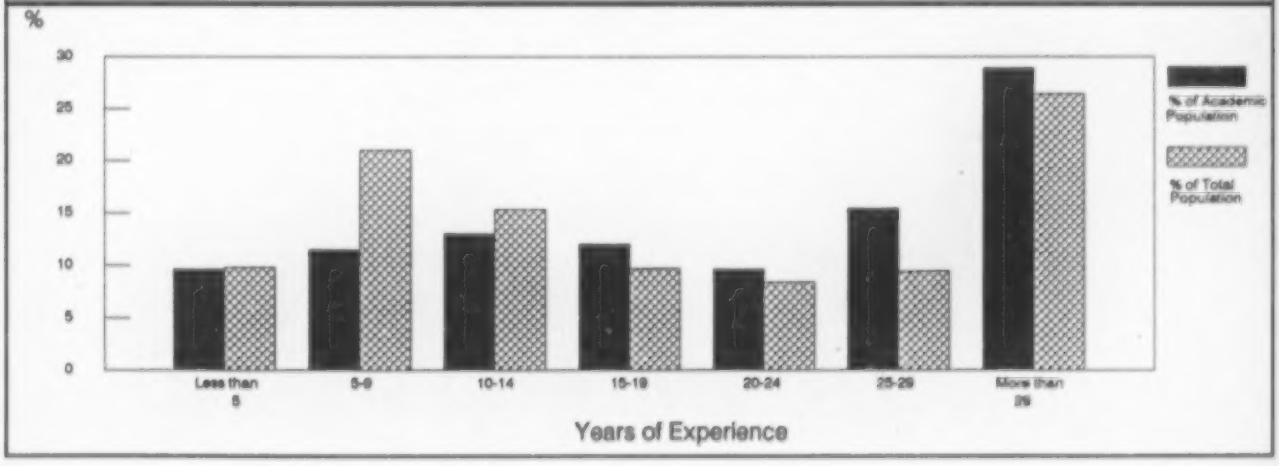
Years of Experience for Academic and Total Population

	% of Academic Population		% of Total Population	
Less than 5	9.6	21.1	9.8	30.8
5-9	11.5		21.0	
10-14	13.0	34.6	15.3	33.4
15-19	12.0		9.7	
20-24	9.6		8.4	
25-29	15.4	44.3	9.4	35.8
More than 29	28.9		26.4	
Total	**100.0**		**100.0**	

The differences in the patterns of concentrations can be seen more clearly when years of experience are selectively combined. For both populations, there are roughly equal percentages for those who have worked 10-24 years. For those who have worked for less than 10 years and for those working for 25 years or more, however, there are significant differences between the academic population and the total population.

Figure K demonstrates these differences:

Figure K
Years of Experience for Academic and Total Population



f. Number of Companies/Institutions Worked For

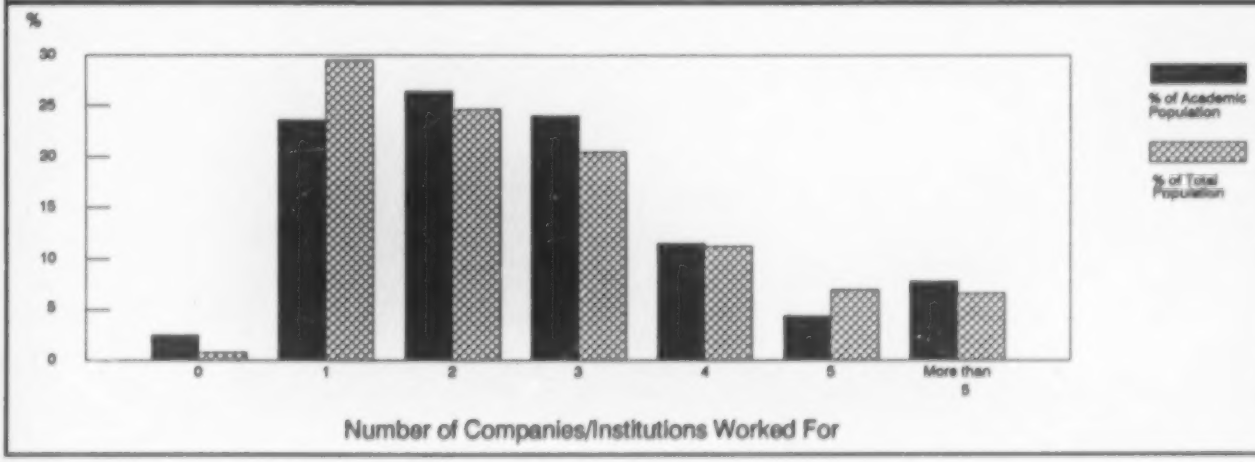
Table 52 and Figure L compare the academic and total populations for number of companies/institutions worked for:

Table 52

Number of Companies/Institutions Worked For
Academic and Total Population

	% of Academic Population	% of Total Population
0	2.4	0.7
1	23.6	29.5
2	26.4	24.6
3	24.0	20.5
4	11.5	11.2
5	4.3	6.9
More than 5	7.7	6.6
Total	**99.9**	**100.0**

Figure L
Number of Companies/Institutions Worked For - Academic and Total Population



g. Income

Total current annual employment income for the academic and total populations is shown in Table 53 and Figure M:

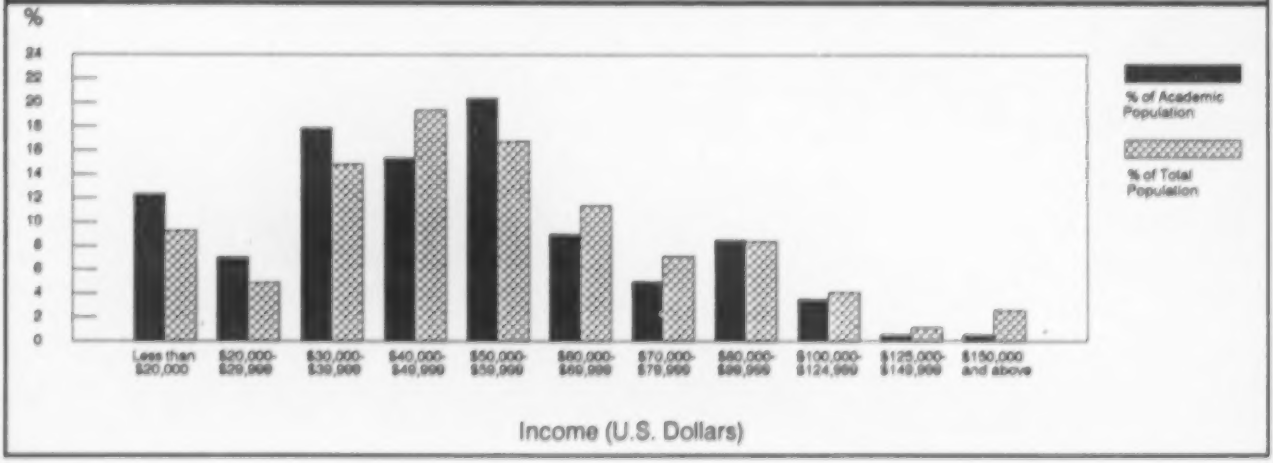
Table 53

Total Current Annual Employment Income
Academic and Total Population (U.S. Dollars)

	% of Academic Population	% of Total Population
Less than $20,000	12.4	9.3
$20,000 - $29,999	7.0	4.9
$30,000 - $39,999	17.9	14.9
$40,000 - $49,999	15.4	19.4
$50,000 - $59,999	20.4	16.8
$60,000 - $69,999	9.0	11.4
$70,000 - $79,999	5.0	7.1
$80,000 - $99,999	8.5	8.4
$100,000 - $124,999	3.5	4.1
$125,000 - $149,999	0.5	1.1
$150,000 and above	0.5	2.6
Total	**100.1**	**100.0**

The median annual income for the academic population is about $3,000 less per year than for the total population ($48,000 and $51,000 respectively).

Figure M
Current Annual Employment Income for Academic and Total Population



h. Primary Work Location

The primary work location for the academic and total populations are somewhat different in concentration. Table 54 and Figure N compare the primary work locations for the two populations:

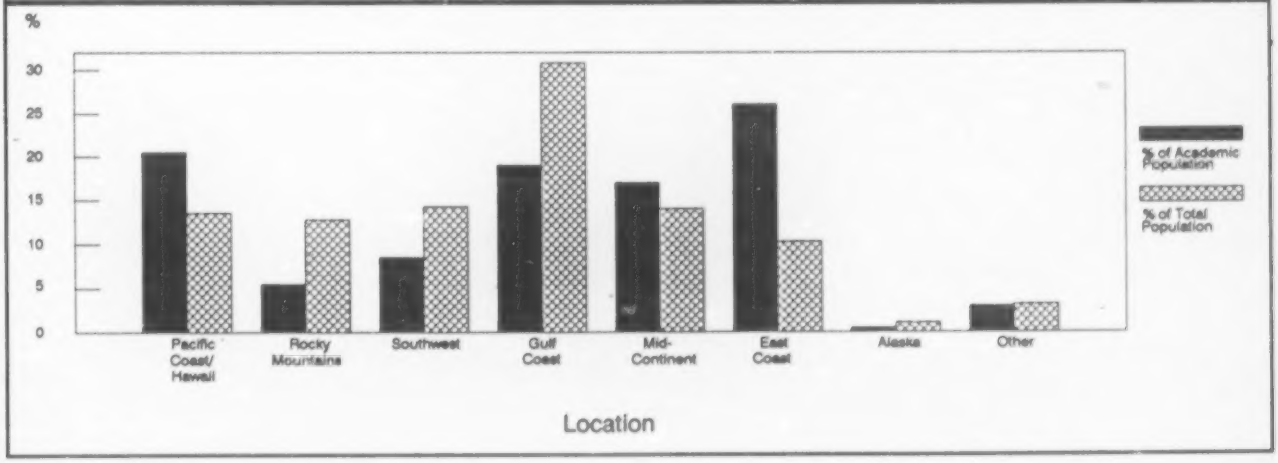
Table 54

Primary Work Location for Academic and Total Population

	% of Academic Population	% of Total Population
Pacific Coast/Hawaii	20.5	13.5
Rocky Mountains	5.5	12.8
Southwest	8.5	14.3
Gulf Coast	19.0	30.8
Mid-Continent	17.0	14.0
East Coast	26.0	10.3
Alaska	0.5	1.1
Other (includes Canada, Central & South America, overseas)	3.0	3.2
Total	**100.0**	**100.0**

Among the possible reasons for the differences in work-force concentrations for the two populations are the location of colleges/universities and the fact that academic employment is not directly linked to geographical/geological location of natural resources (as is the case with the petroleum and the mining/minerals industries).

Figure N
Primary Work Location for Academic and Total Population



i. Race/Ethnic Origin

For the question on race/ethnic origin, the non-Caucasian percentage for the academic population is slightly larger (7.9%) than for the total population (4.2%).

j. Gender

The percentage of females in the academic population is 1/10 of a percent higher than in the total population. For the survey, that difference is not statistically significant.

k. Citizenship

The percentage of U.S. citizens in the academic population (93.3%) is slightly less than it is for the total population (97.3%)

2. Female Population

When examining the results for the female population, it should be kept in mind that the total number of females responding to the survey was 150 (5.2%). While that approximate percentage can be supported independently of the survey (e.g., the percentage of females in the *Directory of Geoscience Departments*), the number of responses to any particular question is small. While the exact percentages are given, those figures should be taken as approximations only.

The analyses for the female population are presented differently from those for the academic population. For all variables examined, the percentages will compare female, male, and total population percentages.

a. Occupational Category

Table 55 shows the female, male, and total population percentages for the major occupational categories:

Table 55

Occupational Category
Females, Males, and Total Population

	% Female	% Male	% Total Population
Geologists, Geochemists, and other Earth Scientists	23.5	27.0	26.9
Geophysicists	32.8	26.7	27.0
Petroleum Engineers	26.9	30.1	29.9
Mining Engineers	1.7	3.9	3.8
Engineering Geologists	9.2	9.6	9.6
Hydrologists/Hydrogeologists	5.9	2.7	2.9
Total	**100.0**	**100.0**	**100.1**

b. Years of Experience

Table 56 and Figure O show the male, female, and total population percentages for years of experience:

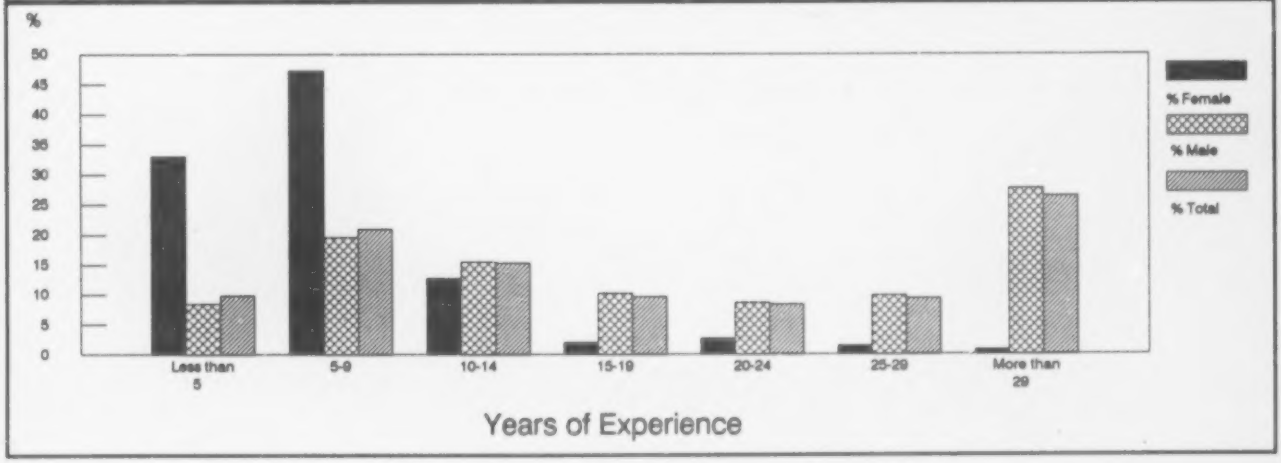
Table 56

Years of Experience
Females, Males, and Total Population

	% Female	% Male	% Total Population
Less than 5	33.1	8.5	9.8
5-9	47.3	19.6	21.0
10-14	12.8	15.5	15.3
15-19	2.0	10.2	9.7
20-24	2.7	8.7	8.4
25-29	1.4	9.8	9.4
More than 29	0.7	27.7	26.4
Total	**100.0**	**100.0**	**100.0**

Female professional geoscientists have been working for fewer years than male geoscientists; a total of 93.2% of the female geoscientific population has worked for 14 years or less, compared to 43.6% of the male geoscientific population.

Figure O
Years of Experience for Females, Males, and Total Population



c. Number of Companies/Institutions Worked For

Table 57 and Figure P show the number of companies/institutions worked for, for the female, male, and total populations:

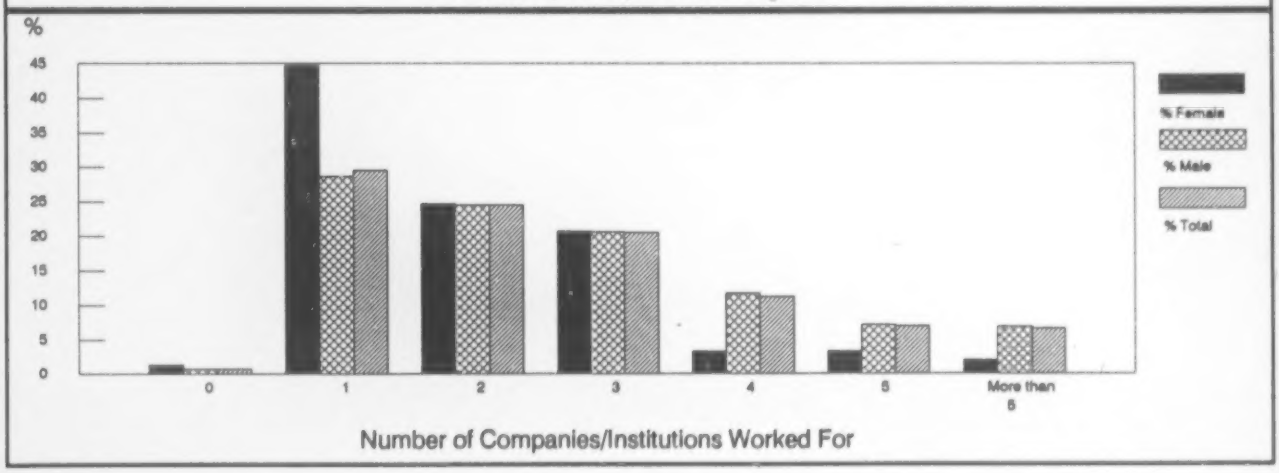
Table 57

Number of Companies/Institutions Worked For
Females, Males, and Total Population

	% Female	% Male	% Total Population
0	1.3	0.7	0.7
1	44.7	28.7	29.5
2	24.7	24.5	24.6
3	20.7	20.6	20.5
4	3.3	11.7	11.2
5	3.3	7.1	6.9
More than 5	2.0	6.8	6.6
Total	**100.0**	**100.1**	**100.0**

The percentage of females working for 4 or more companies/institutions is 8.6%, while the comparable figure for males is 25.6%.

Figure P
Number of Companies/Institutions Worked For
For Females, Males, and Total Population



d. Age

Table 58 and Figure Q show the age distribution for the female, male, and total populations:

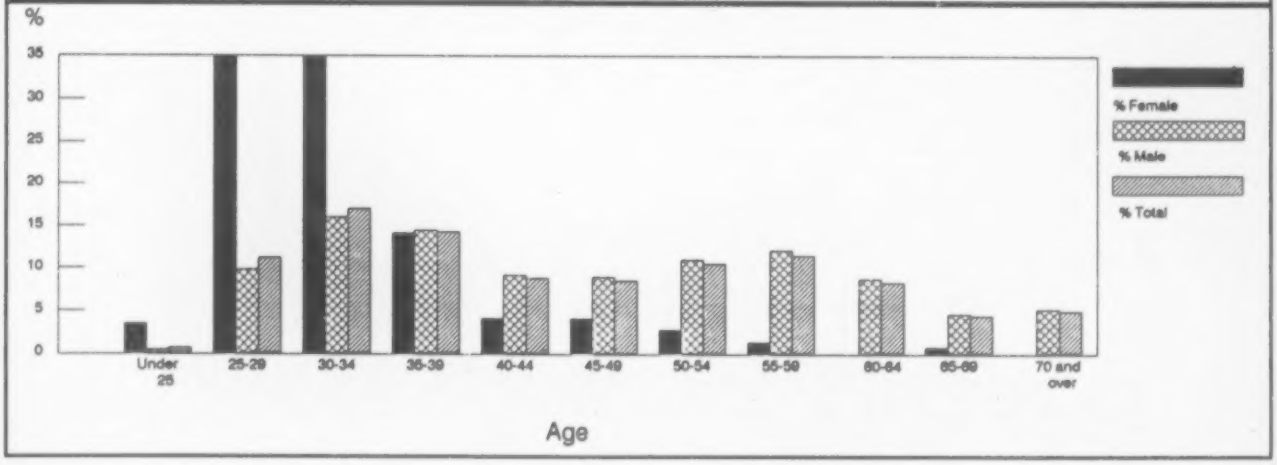
Table 58

Age Distribution
Females, Males, and Total Population

	% Female	% Male	% Total Population
Under 25	3.4	0.4	0.6
25 - 29	34.9	9.8	11.2
30 - 34	34.9	16.0	17.0
35 - 39	14.1	14.4	14.2
40 - 44	4.0	9.1	8.8
45 - 49	4.0	8.9	8.5
50 - 54	2.7	11.0	10.5
55 - 59	1.3	12.1	11.5
60 - 64	0.0	8.7	8.3
65 - 69	0.7	4.6	4.4
70 and over	0.0	5.1	4.9
Total	**100.0**	**100.1**	**99.9**

The age of the female professional population is significantly younger than that of males. Nearly three-quarters (73.2%) of the female geoscience population is under the age of 35, while nearly the same percentage (73.9%) of the males is over the age of 35.

Figure Q
Age Distribution for Females, Males, and Total Population



e. Income

Table 59 and Figure R show the annual income ranges for the female, male, and total geoscience populations:

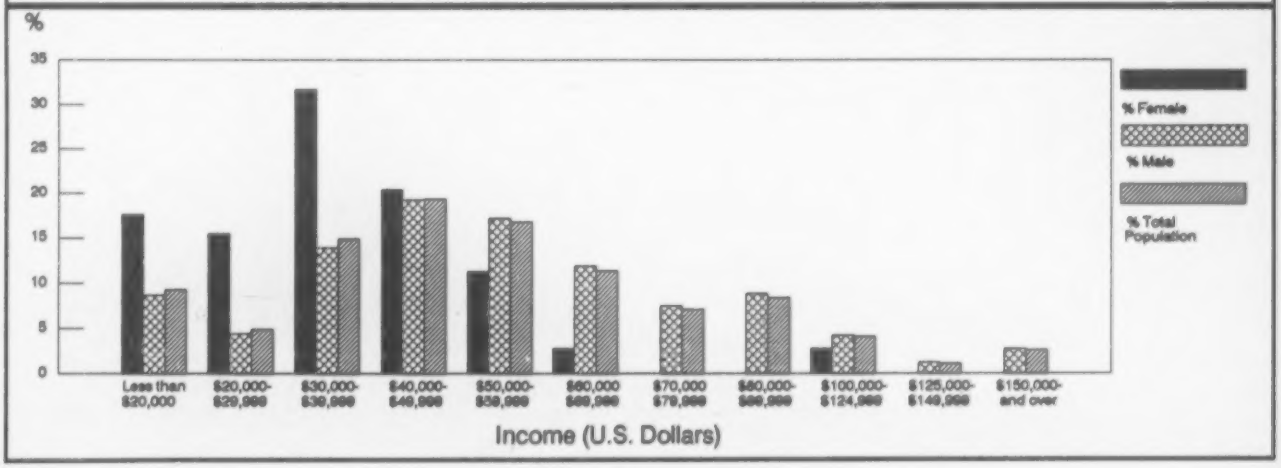
Table 59

Total Current Annual Employment Income
Females, Males, and Total Population (U.S. Dollars)

	% Female	% Male	% Total Population
Less than $20,000	17.6	8.7	9.3
$20,000 - $29,999	15.5	4.4	4.9
$30,000 - $39,999	31.7	13.9	14.9
$40,000 - $49,999	20.4	19.3	19.4
$50,000 - $59,999	11.3	17.2	16.8
$60,000 - $69,999	2.8	11.9	11.4
$70,000 - $79,999	0.0	7.5	7.1
$80,000 - $99,999	0.0	8.9	8.4
$100,000 - $124,999	2.8	4.2	4.1
$125,000 - $149,999	0.0	1.2	1.1
$150,000 and over	0.0	2.7	2.6
Total	**100.1**	**99.9**	**100.0**

The total percentage for females earning $49,999 or less is 85.2%, while the comparable figure for males at that income level is 46.3%.

Figure R
Total Current Annual Employment Income for Females, Males, and Total Population



f. Years of Experience and Income for Females:

Table 60 shows years of experience cross-tabulated with income for the female geoscientific population:

Table 60

Years of Experience by Income, for Females

	Less than $20,000	$20,000-$29,999	$30,000-$39,999	$40,000-$49,999	$50,000-$59,999	$60,000-$69,999	$70,000-$79,999	$80,000-$99,999	$100,000-$124,999
Years of Experience									
Less than 5	12	7	20	7					
Row Percent	26.1	15.2	43.5	15.2					
Col Percent	48.0	31.8	45.5	24.1					
5-9	8	9	19	16	15	2			
	11.6	13.0	27.5	23.2	21.7	2.9			
	32.0	40.9	43.2	55.2	93.8	50.0			
10-14	2	4	5	5	2				
	11.1	22.2	27.8	27.8	11.1				
	8.0	18.2	11.4	17.2	50.0				
15-19	2	1							
	66.7	33.3							
	8.0	4.5							
20-24		1		1	1				
		33.3		33.3	33.3				
		4.5		3.4	6.3				
25-29									1
									100.0
									100.0
More than 29	1								
	100.0								
	4.0								
Total	**25**	**22**	**44**	**29**	**16**	**4**			**1**
% of Total	**17.7**	**15.6**	**31.2**	**20.6**	**11.3**	**2.8**			**.7**

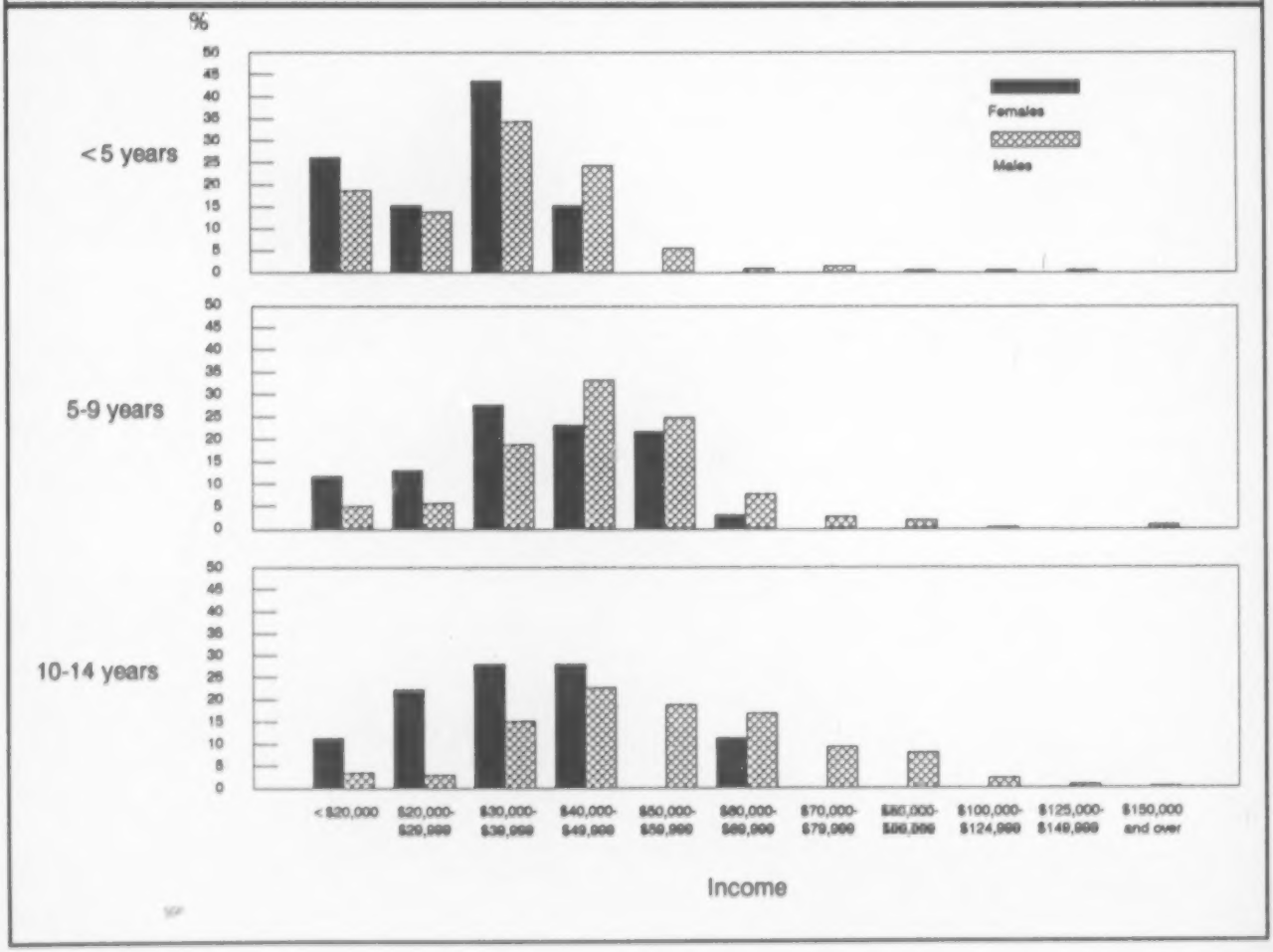
Table 61 and Figure S compare female and male annual employment income for selected years of experience.

Table 61

Years of Experience and Income for Females and Males (as percentage for each income level)

	< $20,000	$20,000- $29,999	$30,000- $39,999	$40,000- $49,999	$50,000- $59,999	$60,000- $69,999	$70,000- $79,999	$80,000- $99,999	$100,000- $124,999	$125,000- $149,999	$150,000- and over
Years of Experience											
Less than 5											
Females	26.1	15.2	43.5	15.2							
Males	18.7	13.7	34.2	5.5	0.9	1.4	0.5	0.5	0.5		
5-9											
Females	11.6	13.0	27.5	23.2	21.7	2.9					
Males	5.0	5.6	18.8	33.1	24.8	7.7	2.5	1.7	0.2		0.6
10-14											
Females	11.1	22.2	27.8	27.8		11.1					
Males	3.4	2.9	15.1	22.6	18.7	16.8	9.2	8.0	2.2	0.7	0.2

Figure S
Years of Experience and Income, for Females and Males



3. Comparisons between Principal and Graduate Surveys

The commercial list used for the principal survey was presumably derived from membership lists of various professional geoscientific organizations. Therefore, AGI decided to conduct a parallel survey with a population not derived from such lists. The purpose was to determine the number of geoscientists who belong to no professional geoscientific organizations. Thus, 30 college/university geoscience departments were asked to provide lists of their alumni. From a sample size of approximately 5,000, 1,727 (34.5%) responded. This "graduate" survey provided an additional set of raw data that could be compared to the data from the principal survey. This section reports on those comparisons of raw data sets for selected demographic/employment variables: age, years of experience, occupational level, number of companies/institutions worked for, and income.

a. Age

The median age for the graduate survey sample is younger by about four years than the principal survey sample. Possible reasons for this difference include the likelihood that geoscience department alumni rolls show a high proportion of recent graduates, whose median age would be younger than that of the general geoscience population. In addition, since most professional organizations have some sort of employment/experience requirements, that population would reflect an older median age.

Table 62 shows the age distribution for the principal and graduate surveys and for the two populations combined:

Table 62

Comparison of Age Distribution
Principal Survey, Graduate Survey and Combined

	Principal Survey %	Graduate Survey %	Combined Survey %
<25	0.6	4.2	1.9
25-29	11.2	14.0	12.2
30-34	17.0	17.8	17.3
35-39	14.2	14.4	14.3
40-44	8.8	7.2	8.2
45-49	8.6	7.5	8.2
50-54	10.5	9.9	10.3
55-59	11.5	8.7	10.5
60-64	8.3	8.0	8.2
65-69	4.4	4.5	4.4
69	4.9	3.8	4.5
Total	**100.0**	**100.0**	**100.0**
Median	**43.9**	**39.9**	**42.6**

Given the 4-year difference in median age for the principal and graduate survey populations, the following comparisons consistently reflect that difference.

b. Years of Experience

For this category, the most noticeable differences occur in the less than 5- and greater than 29-years of experience ranges, as shown in Table 63:

Table 63

Comparison of Years of Experience
Principal Survey, Graduate Survey and Combined

	Principal Survey %	Graduate Survey %	Combined Survey %
<5	9.8	32.9	18.3
5-9	21.0	18.0	19.9
10-14	15.3	10.5	13.5
15-19	9.7	7.2	8.8
20-24	8.4	6.2	7.6
25-29	9.4	7.1	8.5
29	26.5	18.0	23.3
Total	**100.1**	**99.9**	**99.9**
Median	**17.0**	**9.8**	**14.4**

c. Occupational Level

The occupational level for the younger graduate survey population shows a correspondingly greater concentration at the lower occupational levels, as shown in Table 64:

Table 64

Comparison of Occupational Level[1]
Principal Survey, Graduate Survey and Combined

	Principal Survey %	Graduate Survey %	Combined Survey %
1	22.7	18.0	21.0
2	45.7	38.1	43.0
3	26.3	26.5	26.4
4	4.0	11.2	6.5
5	1.3	6.2	3.1
Total	**100.0**	**100.0**	**100.0**
Median	**2.6**	**2.8**	**2.7**

1 1) SeniorManager/Director/Dean/Department Head
2) Senior Professional/Professor/Associate Professor/Middle Manager
3) Professional/Assistant Professor/Assistant Superintendent
4) Junior Professional/Instructor/Foreman
5) Technician/Paraprofessional

d. Number of Companies/Institutions Worked For

This category is not dependent solely on age. While a younger population would show a greater concentration among those working for no companies or one company, the remaining distribution is not necessarily age specific. Table 65 shows the comparison:

Table 65

Comparison of Number of Companies/Institutions Worked For
Principal Survey, Graduate Survey and Combined

	Principal Survey %	Graduate Survey %	Combined Survey %
0	0.7	5.8	2.6
1	29.5	33.3	30.9
2	24.6	26.7	25.3
3	20.5	14.6	18.3
4	11.3	10.1	10.8
5	6.9	4.6	6.1
5	6.6	4.9	6.0
Total	**100.1**	**100.0**	**100.0**
Median	**2.8**	**2.4**	**2.6**

e. Income

Table 66 presents the income distribution for the two population samples and the combined survey distribution percentages:

Table 66

Comparison of Income Levels
Principal Survey, Graduate Survey and Combined

	Principal Survey %	Graduate Survey %	Combined Survey %
< $20,000	9.3	31.2	17.1
$20,000-$29,999	4.9	11.7	7.3
$30,000-$39,999	14.9	15.9	15.3
$40,000-$49,999	19.4	13.5	17.3
$50,000-$59,999	16.8	8.8	14.0
$60,000-$69,999	11.4	7.2	9.9
$70,000-$79,999	7.0	3.1	5.7
$80,000-$99,999	8.4	3.8	6.8
$100,000-$124,999	4.1	2.2	3.4
$125,000-$149,999	1.1	0.7	1.0
$150,000 and over	2.6	1.8	2.3
Total	**99.9**	**99.9**	**100.1**
Median	**$50,892**	**$34,465**	**$45,954**

D. Student Enrollment/Degrees Granted

The American Geological Institute has been collecting geoscience student-enrollment and degrees-granted information for more than 15 years. Data are available according to enrollment levels (freshmen/sophomore majors through PhD candidates) and degrees granted (BA/BS, MA/MS, PhD) for 13 geoscience subdisciplines.

Although information on student enrollments and degrees granted was specifically excluded from the scope of the North American Survey of Geoscientists (by excluding students from the survey population), it has obvious bearing on the future of the geoscience profession. As stated earlier, there seems to be an adequate current supply of geoscientists to replenish any short-term shortages within the profession. The major problems in employment have always revolved around the chronic and persistent imbalance between supply and demand. The availability of information on levels of supply and demand may help in modulating these imbalances.

In addition, the survey has demonstrated resoundingly the absence of minorities in the geoscience profession. It has been projected that by the year 2000, 44.1% of the total U.S. population will be composed of minority populations. While the proportion of minority populations will continue to grow, there is no current evidence to indicate a corresponding increase in the numbers of minority enrollments or degrees earned.

The proportions of enrollments and degrees granted for females are increasing, though not nearly in keeping with the overall female percentage of the total population.

Below are presented the total enrollments and degrees granted for each of the 13 subdisciplines of the geosciences for which AGI has collected information. Response rates for the annual student enrollment surveys have averaged about 80%. For an approximation of actual numbers, all figures should be multiplied by a factor of 1.2.

Table 67

U.S. Geoscience Student Enrollments and Degrees Granted
1974 - 1987

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
All Fields														
Enrollments														
Undergraduate	21,349	21,311	18,439	24,464	25,399	28,674	30,495	31,987	34,343	36,893	29,722	31,149	20,584	15,179
Graduate	7,895	8,038	6,441	8,445	8,843	9,112	9,881	10,180	10,108	10,408	9,695	11,381	10,917	9,650
Total	**29,244**	**29,349**	**24,880**	**32,909**	**34,242**	**37,786**	**40,376**	**42,167**	**44,451**	**47,301**	**39,417**	**42,530**	**31,501**	**24,829**
Degrees														
BA/BS	5,092	3,650	4,774	4,986	5,982	6,328	6,580	6,879	7,253	5,309	5,039	6,947	5,931	4,420
MA/MS	1,655	1,267	1,577	1,648	1,799	1,802	1,826	2,014	1,868	1,200	1,063	2,025	2,109	1,993
PhD	548	416	486	520	455	473	486	484	465	318	275	529	573	615
Total	**7,295**	**5,333**	**6,837**	**7,154**	**8,236**	**8,603**	**8,892**	**9,377**	**9,586**	**6,827**	**6,377**	**9,501**	**8,613**	**7,028**
SUBDISCIPLINES														
Geology														
Enrollments														
Undergraduate	15,034	15,674	13,869	18,225	19,036	20,823	22,736	25,047	27,155	28,727	22,032	21,445	13,626	9,650
Graduate	4,662	4,683	3,788	4,582	4,849	5,043	5,799	6,140	6,176	6,157	5,882	6,642	6,648	5,438
Total	**19,696**	**20,357**	**17,657**	**22,807**	**23,885**	**25,866**	**28,535**	**31,187**	**33,331**	**34,884**	**27,914**	**28,087**	**20,274**	**15,088**
Degrees														
BA/BS	3,640	2,666	3,583	3,669	4,359	4,707	5,092	5,352	5,544	4,230	3,723	5,016	4,283	3,008
MA/MS	952	722	959	1,030	1,137	1,127	1,218	1,357	1,149	774	591	1,300	1,305	1,229
PhD	286	210	254	243	196	205	258	266	203	142	84	219	240	313
Total	**4,878**	**3,598**	**4,796**	**4,942**	**5,692**	**6,039**	**6,568**	**6,975**	**6,896**	**5,146**	**4,398**	**6,535**	**5,828**	**4,550**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Geophysics														
Enrollments														
Undergraduate	446	266	436	512	529	689	906	873	877	1,194	1,181	885	654	668
Graduate	721	612	522	745	879	847	883	893	892	930	1,093	1,164	953	1,094
Total	**1,167**	**878**	**958**	**1,257**	**1,408**	**1,536**	**1,789**	**1,766**	**1,769**	**2,124**	**2,274**	**2,049**	**1,607**	**1,762**
Degrees														
BA/BS	94	64	80	97	80	151	174	158	217	181	207	275	266	225
MA/MS	147	81	92	135	143	166	120	165	171	135	124	189	140	201
PhD	69	39	41	62	55	73	58	58	49	39	57	58	65	97
Total	**310**	**184**	**213**	**294**	**278**	**390**	**352**	**381**	**437**	**355**	**388**	**522**	**471**	**523**
Oceanography/Marine Science														
Enrollments														
Undergraduate	1,896	1,214	819	1,342	1,543	1,565	1,497	881	887	960	949	1,198	800	1,230
Graduate	1,336	1,137	909	1,078	1,316	1,257	1,458	1,462	1,439	1,458	870	1,268	1,399	1,142
Total	**3,232**	**2,351**	**1,728**	**2,420**	**2,859**	**2,822**	**2,955**	**2,343**	**2,326**	**2,418**	**1,819**	**2,466**	**2,199**	**2,372**
Degrees														
BA/BS	246	102	238	320	354	301	173	308	173	134	140	181	169	178
MA/MS	192	174	177	197	198	202	208	192	218	94	60	165	278	171
PhD	93	89	65	102	113	91	86	78	103	69	46	93	159	116
Total	**531**	**365**	**480**	**619**	**665**	**594**	**467**	**578**	**494**	**297**	**246**	**439**	**606**	**465**
Geological Engineering														
Enrollments														
Undergraduate	800	580	446	833	924	1,253	1,335	1,383	1,626	2,552	1,758	1,779	1,261	615
Graduate	287	118	117	304	342	405	184	164	168	387	277	460	284	281
Total	**1,087**	**698**	**563**	**1,137**	**1,266**	**1,658**	**1,519**	**1,547**	**1,794**	**2,939**	**2,035**	**2,239**	**1,545**	**896**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Degrees														
BA/BS	137	61	123	141	202	216	244	218	487	216	347	392	489	255
MA/MS	30	27	66	54	67	40	45	45	90	30	45	85	100	70
PhD	9	9	11	17	9	4	11	6	16	6	6	29	17	15
Total	**176**	**97**	**200**	**212**	**278**	**260**	**300**	**269**	**593**	**252**	**398**	**506**	**606**	**340**

Geophysical Engineering

Enrollments														
Undergraduate		12	1	207	182	183	199	235	284	328	54	406	259	150
Graduate		1	26	88	95	81	83	100	102	95	8	151	90	64
Total		**13**	**27**	**295**	**277**	**264**	**282**	**335**	**386**	**423**	**62**	**557**	**349**	**214**
Degrees														
BA/BS	12	1	24	41	40	30	49	52	62	9	6	95	11	44
MA/MS	1	4	9	7	5	9	22	14	13	10	7	44	6	19
PhD	0	8	2	2	1	5	7	5	2	5	1	1	0	3
Total	**13**	**13**	**35**	**50**	**46**	**44**	**78**	**71**	**77**	**24**	**14**	**140**	**17**	**66**

Geochemistry

Enrollments														
Undergraduate	59	62	99	58	62	65	65	59	74	3	45	57	87	25
Graduate	123	245	190	405	305	351	428	406	377	293	372	396	349	249
Total	**182**	**307**	**289**	**463**	**367**	**416**	**493**	**465**	**451**	**332**	**417**	**453**	**436**	**274**
Degrees														
BA/BS	16	5	5	11	13	5	14	25	17	2	10	21	24	13
MA/MS	39	43	43	44	41	50	44	56	28	27	29	36	39	33
PhD	28	14	27	34	25	29	26	27	30	20	15	29	24	13
Total	**83**	**62**	**75**	**89**	**79**	**84**	**84**	**108**	**75**	**49**	**54**	**86**	**87**	**59**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Hydrology														
Enrollments														
Undergraduate	27	93	52	58	49	173	62	93	91	110	353	587	110	231
Graduate	96	127	143	171	255	244	233	233	254	253	311	479	417	452
Total	**123**	**220**	**195**	**229**	**304**	**417**	**295**	**326**	**345**	**363**	**664**	**1,066**	**527**	**683**
Degrees														
BA/BS	7	3	45	10	26	15	22	24	23	57	63	164	30	56
MA/MS	25	20	68	53	41	51	44	55	50	26	81	70	84	100
PhD	11	9	33	20	7	9	11	11	8	7	15	11	16	6
Total	**43**	**32**	**146**	**83**	**74**	**75**	**77**	**90**	**81**	**90**	**159**	**245**	**130**	**162**
Mineralogy														
Enrollments														
Undergraduate		313	106	86	74	62	45	12	118	223	199	156	54	44
Graduate		145	107	90	67	78	106	91	98	168	91	75	43	62
Total		**458**	**213**	**176**	**141**	**140**	**151**	**103**	**216**	**391**	**290**	**231**	**97**	**106**
Degrees														
BA/BS	18	0	2	2	2	3	5	6	59	19	28	39	0	6
MA/MS	19	13	21	10	16	14	14	14	21	5	9	18	5	10
PhD	12	4	9	9	6	8	6	16	9	11	8	15	3	2
Total	**49**	**17**	**32**	**21**	**24**	**25**	**25**	**36**	**89**	**35**	**45**	**72**	**8**	**18**
Paleontology														
Enrollments														
Undergraduate	32	129	108	91	42	55	63	29	135	44	94	113	41	42
Graduate	95	224	207	275	221	252	276	216	199	170	237	194	176	198
Total	**127**	**353**	**315**	**366**	**263**	**307**	**339**	**245**	**334**	**214**	**331**	**307**	**217**	**240**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Degrees														
BA/BS	14	14	11	3	8	15	16	2	4	6	14	5	12	11
MA/MS	33	31	37	20	14	34	22	27	26	20	13	24	29	25
PhD	17	24	26	15	21	23	8	5	9	13	14	8	12	10
Total	**64**	**69**	**74**	**38**	**43**	**72**	**46**	**34**	**39**	**39**	**41**	**37**	**53**	**46**

Soil Science

Enrollments														
Undergraduate		0	51	55	74	48	162	145	41	31	244	33	59	119
Graduate		1	2	7	1	7	9	10	1	1	3	1	0	67
Total		**1**	**53**	**62**	**75**	**55**	**171**	**155**	**42**	**32**	**247**	**34**	**59**	**186**
Degrees														
BA/BS	3	0	8	6	17	40	46	4	8	9	0	4	8	21
MA/MS	5	0	1	1	0	6	3	0	0	0	0	0	0	19
PhD	1	0	1	0	0	1	0	0	0	0	0	0	0	5
Total	**9**	**0**	**10**	**7**	**17**	**47**	**49**	**4**	**8**	**9**	**0**	**4**	**8**	**45**

Environmental Science

Enrollments														
Undergraduate	324	604	652	967	931	1,245	1,415	1,249	1,098	704	748	1,451	1,447	673
Graduate	118	145	89	264	164	259	164	161	153	190	275	194	143	272
Total	**442**	**749**	**741**	**1,231**	**1,095**	**1,504**	**1,579**	**1,410**	**1,251**	**894**	**1,023**	**1,645**	**1,590**	**945**
Degrees														
BA/BS	132	140	196	252	357	333	335	302	240	203	181	262	244	162
MA/MS	19	7	42	28	56	37	33	36	34	49	42	26	38	65
PhD	11	6	7	4	8	4	9	3	17	6	5	8	3	9
Total	**162**	**153**	**245**	**284**	**421**	**374**	**377**	**341**	**291**	**258**	**228**	**296**	**285**	**236**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Earth Science/Teaching														
Enrollments														
Undergraduate	1,651	949	812	765	520	460	445	372	305	327	277	514	488	616
Graduate	384	362	225	218	123	115	91	79	65	56	25	60	67	97
Total	2,035	1,311	1,037	983	643	575	536	451	370	383	302	574	555	713
Degrees														
BA/BS	396	301	186	145	179	69	91	69	56	46	52	70	103	109
MA/MS	145	121	31	34	37	22	14	20	18	11	14	16	11	32
PhD	0	0	0	0	0	0	0	0	0	0	2	2	0	25
Total	541	422	217	179	216	91	105	89	74	57	68	88	114	166
Earth Science/General														
Enrollments														
Undergraduate	1,080	1,415	988	1,265	1,433	2,053	1,565	1,609	1,652	1,654	1,788	2,525	1,698	1,116
Graduate	63	238	116	218	226	173	167	225	184	250	251	297	348	234
Total	1,143	1,653	1,104	1,483	1,659	2,226	1,732	1,834	1,836	1,904	2,039	2,822	2,046	1,350
Degrees														
BA/BS	337	293	273	289	345	443	319	359	363	197	268	423	292	332
MA/MS	48	24	31	35	44	44	39	33	44	19	48	52	74	32
PhD	11	4	9	11	14	21	6	9	19	0	22	56	34	25
Total	396	321	313	335	403	508	364	401	426	216	338	531	400	389

The figures below present total enrollments and degrees granted for all fields combined (Figure T), and the subdisciplines of geology (Figure U) and geophysics (Figure V).

Figure T
Total U.S. Enrollments and Degrees Granted for All Fields

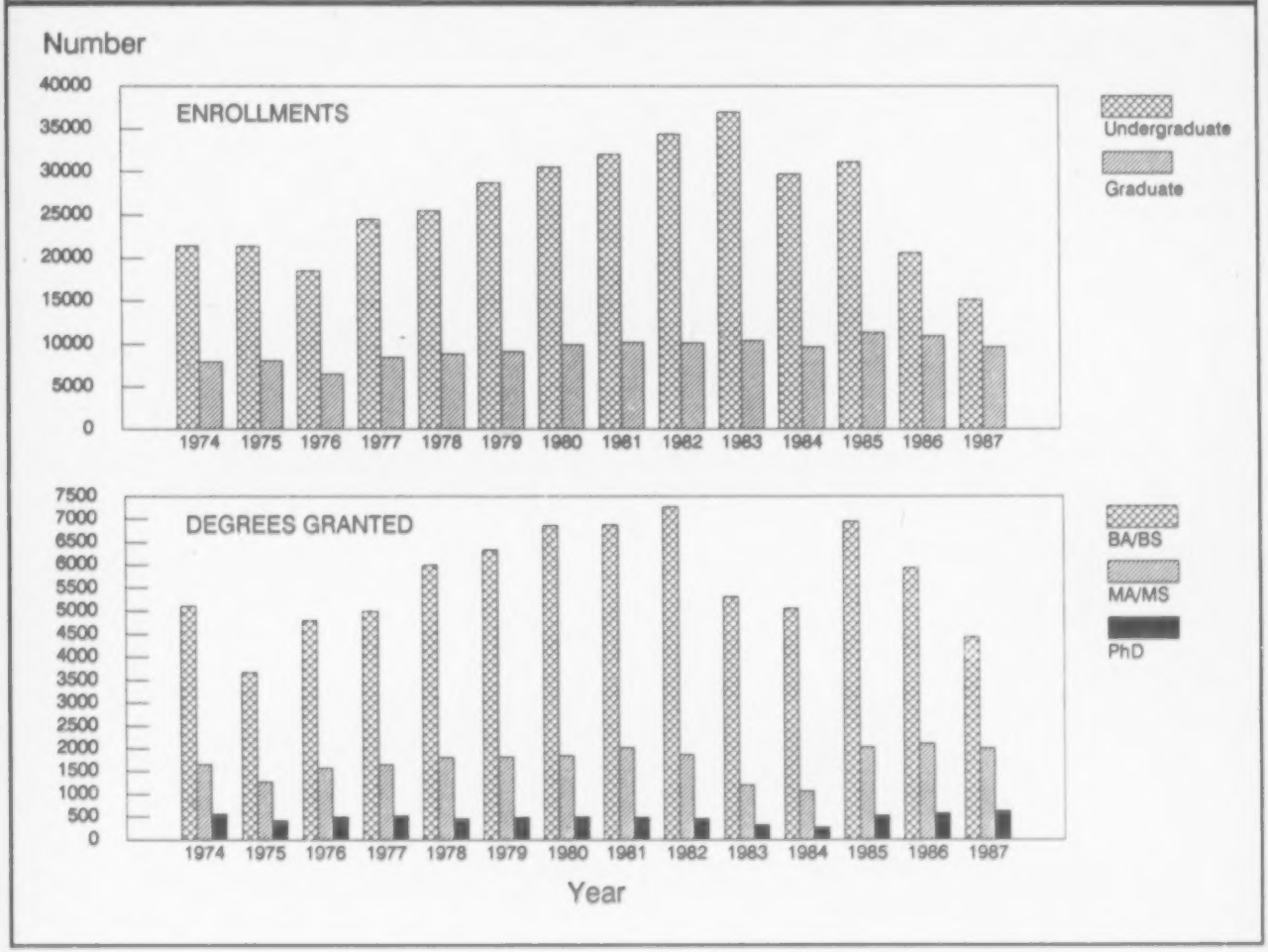


Figure U
Total U.S. Enrollments and Degrees Granted for Geology

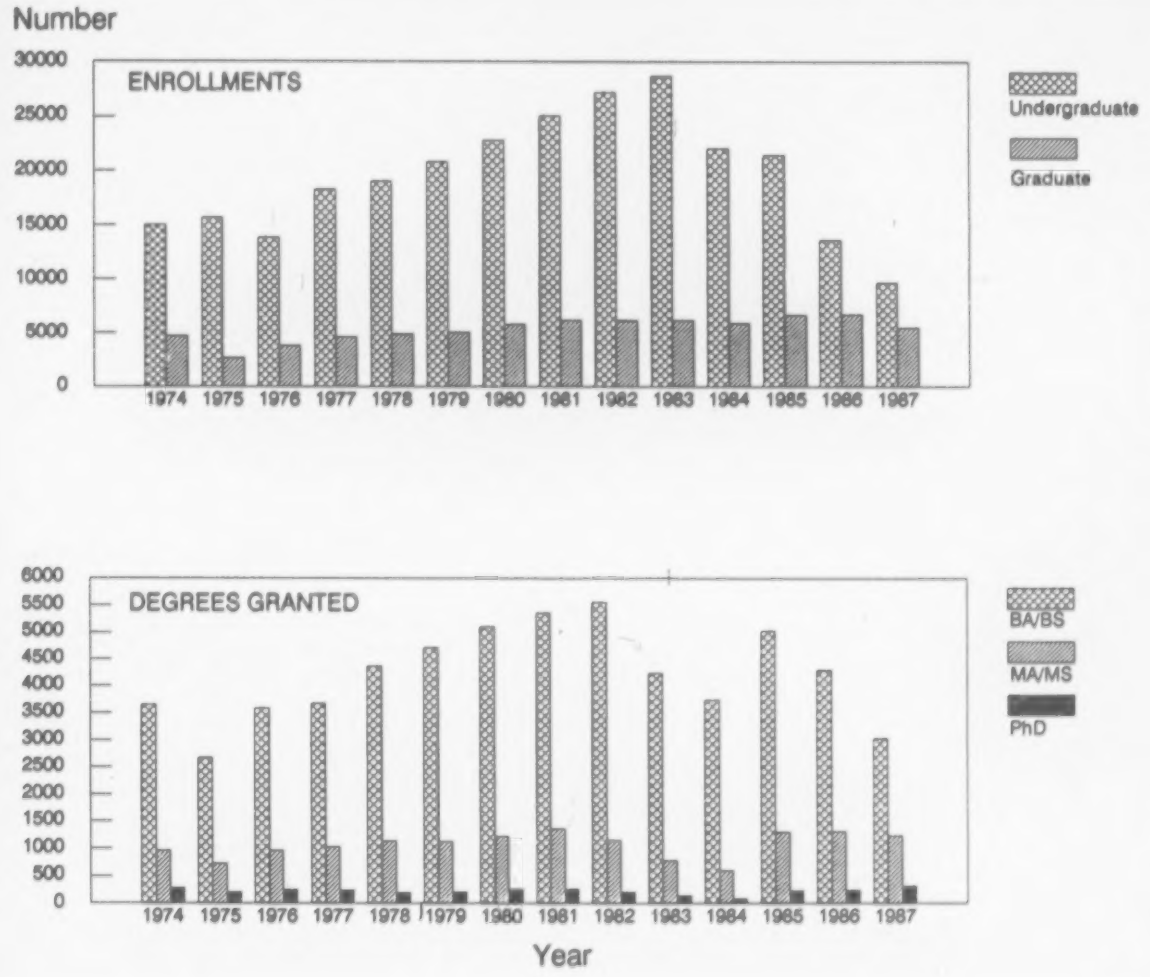
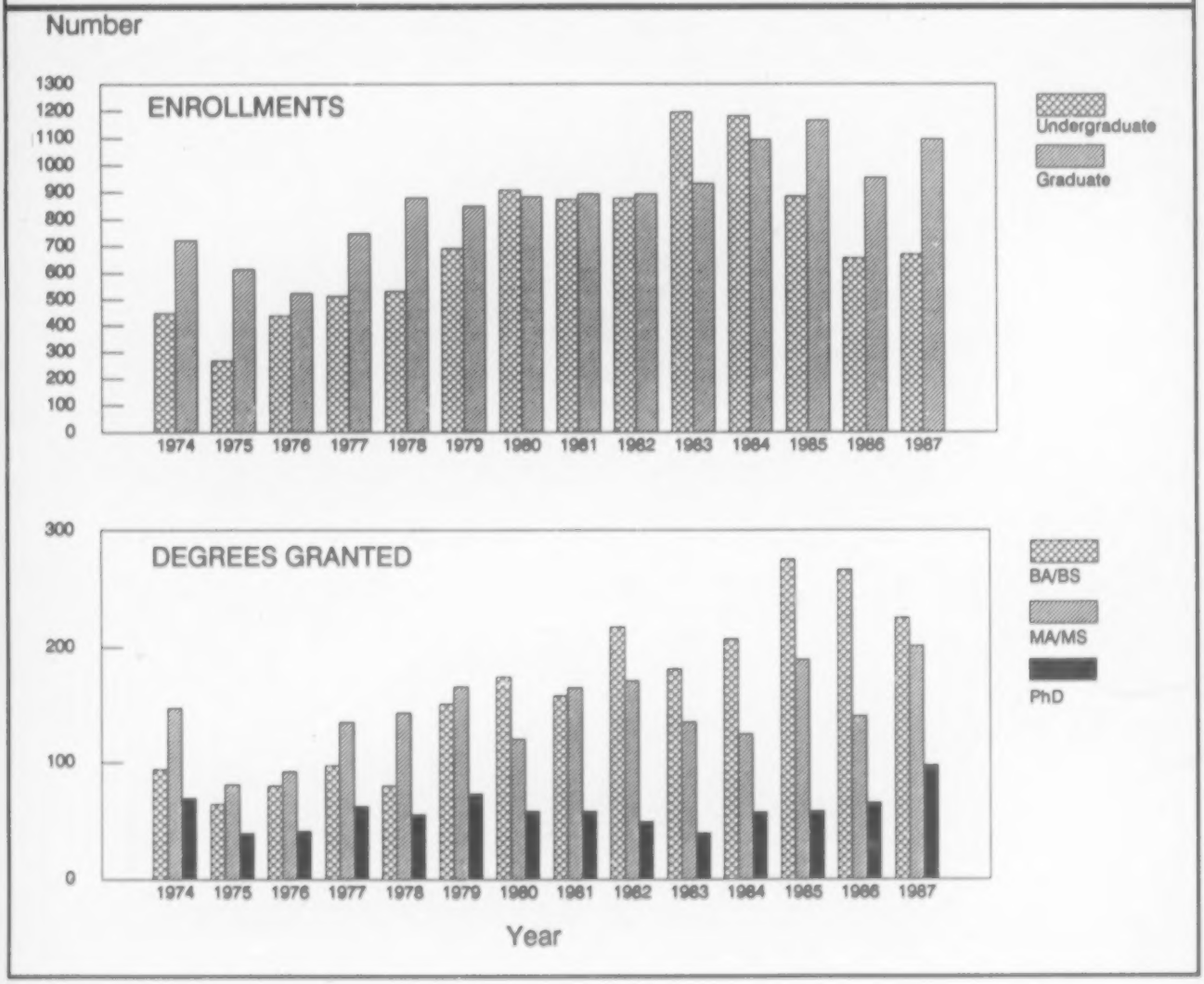


Figure V
Total U.S. Enrollments and Degrees Granted for Geophysics



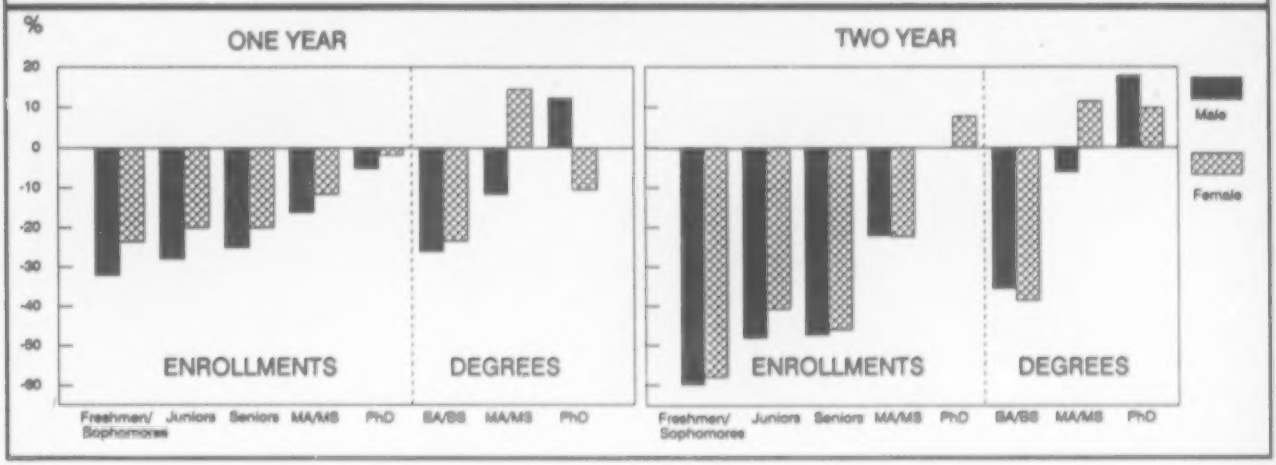
As a general indication of the recent overall decline in enrollments and in bachelor's degrees, Table 68 and Figure W show the changes in percentages for the most recent one- and two-year periods.

Table 68

Percentages of Change for U.S. Geoscience Student Enrollments and Degrees Granted One Year (1986-87) and Two Year (1985-87)

	Male	Female
ONE YEAR:		
Undergraduate Enrollments		
Freshmen/Sophomores	-32.1	-23.5
Juniors	-28.0	-20.0
Seniors	-25.0	-20.0
Graduate Enrollments		
MA/MS	+16.2	-11.6
PhD	- 5.2	- 1.8
Degrees Granted		
BA/BS	-26.1	-23.4
MA/MS	+11.7	+14.5
PhD	+12.3	-10.5
TWO YEAR:		
Undergraduate Enrollments		
Freshmen/Sophomores	-59.9	-58.0
Juniors	-48.0	-40.7
Seniors	-47.3	-46.0
Graduate Enrollments		
MA/MS	+22.1	-22.4
PhD	0.0	+ 7.7
Degrees Granted		
BA/BS	-35.6	-38.5
MA/MS	+6.0	+11.5
PhD	+17.8	+9.9

Figure W
Percentages of Change for U.S. Geoscience Student Enrollments and Degrees Granted One Year (1986-87) and Two Year (1985-87)



III. Survey Results - Canadian Section

A. Analysis of Survey Data

1. Educational Background (Question I)

Respondents were asked to indicate the degrees at all levels in which they had received training relevant to their geoscientific employment.[1] Table 1 shows the geoscientific specialty and degrees earned:

Table 1

Geoscientific Specialty and Degree (Canada)

	Number of Degrees				
	BA/BS	MA/MS	PhD	Total	% of Total
Geology					
Atmospheric Science	6	9	6	21	0.4
Economic and Mining Geology	303	220	84	607	12.7
Environmental Geology	12	6	2	20	0.4
General Geology and Earth Science	1,176	99	44	1,319	27.5
Geochemistry	27	73	83	183	3.8
Geomorphology	63	56	40	159	3.3
Marine Geology/Marine Geophysics	3	10	10	23	0.5
Mathematical Geology/Geostatistics	2	7	6	15	0.3
Mineralogy	20	43	29	92	1.9
Oceanography	3	5	6	14	0.3
Paleontology and Palynology	16	55	56	127	2.7
Petroleum Geology	139	31	5	175	3.7
Petrology	33	101	83	217	4.5
Planetology	1	4	4	9	0.2
Remote Sensing	1	6	5	12	0.3
Sedimentology	21	69	54	144	3.0
Soil Science	5	9	5	19	0.4
Stratigraphy	23	51	35	109	2.3
Structural Geology and Tectonics	16	55	55	126	2.6
Volcanology	4	9	9	22	0.5
Subtotal	1,874	918	621	3,413	71.3

1 Although the Associate of Arts degree (AA) was included in the survey questionnaire, those responses were excluded because so few professional geoscientists have only that degree.

	BA/BS	MA/MS	PhD	Total	% of Total
Geophysics					
Geophysics	130	87	66	283	5.9
Petroleum Geophysics	11	12	4	27	0.6
Subtotal	141	99	70	310	6.5
Petroleum Engineering	11	3	4	18	0.4
Mining Engineering	36	7	3	46	1.0
Engineering Geology and Engineering Geophysics	186	33	8	227	4.7
Hydrology and Hydrogeology	4	18	4	26	0.5
Total Geoscientific	2,252	1,078	710	4,040	84.4
Non-Geoscientific					
Chemistry	105	22	21	148	3.1
Civil Engineering	31	15	13	59	1.2
Computer Science	6	4	4	14	0.3
Electrical Engineering	23	4	1	28	0.6
Liberal Arts	52	3	4	59	1.2
Mathematics	52	6	1	59	1.2
Mechanical Engineering	15	3	1	19	0.4
Physics	118	31	16	165	3.5
Other Engineering/Scientific	48	17	12	77	1.6
Other	72	36	13	121	2.5
Total Non-geoscientific	522	141	86	749	15.6
Total Degrees	2,774	1,219	796	4,789	100.0

a. Most frequent degree (by individual specialty, all degrees combined)

The most frequent degrees held are as follows:

	% Response
General Geology and Earth Sciences	27.5
Economic and Mining Geology	12.7
Geophysics	5.9
Engineering Geology/Engineering Geophysics	4.7
Petrology	4.5

Within general categories of specialties, the most frequent degrees (all degrees combined) are in the following:

	% Response
Geology	71.3
Geophysics	5.9
Engineering Geology/Engineering Geophysics	4.7
Mining Engineering	1.0
Hydrology	0.5
Non-geoscientific	15.6

Among those with non-geoscientific degrees (but who are working in geoscientific specialties), the most frequent degrees (all degrees combined) are in the following disciplines:

	% Response
Physics	3.5
Chemistry	3.1
Other Engineering/Scientific	1.6
Other	2.5

b. Levels of degrees

Of the total degrees held by respondents, 57.9% are bachelor's, 25.5% are master's, and 16.6% are doctoral. Since many individuals hold more than one degree, it was possible to break down the population by highest degree held. The total number of each degree level was divided by the total number of respondents for this question (2,408). The results are as follows:

	% Reporting Degree	
Bachelor's	115.2	(i.e., 15.2% have 2 bachelor's)
Master's	50.6	
PhD	33.1	

For all geoscientific specialties, 55.7% have a bachelor's degree, 26.7% have a master's degree, and 17.6% have a doctoral degree as the highest degree.

A total of 15.6% of the total degrees held by respondents was in non-geoscientific specialties. Within this category, 69.7% have a bachelor's degree, 18.8% have a master's degree, and 11.5% have a doctoral degree as the highest degree.

2. Geoscientific Specialties (Questions II and III)

a. Specialties Held

The survey produced information on primary and secondary geoscientific specialties of the professional population.[1] The question was intended to assess the profession's skills as developed through formal education and work experience. Table 2 shows the responses.[2]

1 To hold a geoscientific specialty, the respondent had to have either a degree in the specialty or 3 or more years' experience in the specialty.

2 The totals for primary and secondary specialties were combined.

Table 2

Geoscientific Specialty (Canada)

	Number	% of Total Specialties	% of Respondents
Geology			
Atmospheric Science	20	0.3	0.8
Economic and Mining Geology	902	13.6	36.7
Environmental Geology	111	1.7	4.5
General Geology and Earth Science	628	9.5	25.6
Geochemistry	484	7.3	19.7
Geomorphology	160	2.4	6.5
Marine Geology/Marine Geophysics	95	1.4	3.9
Mathematical Geology/Geostatistics	97	1.5	4.0
Mineralogy	201	3.0	8.2
Oceanography	24	0.4	1.0
Paleontology and Palynology	109	1.7	4.4
Petroleum Geology	827	12.5	33.6
Petrology	261	3.9	10.6
Planetology	8	0.1	0.3
Remote Sensing	87	1.3	3.5
Sedimentology	352	5.3	14.3
Soil Science	56	0.9	2.3
Stratigraphy	450	6.8	18.3
Structural Geology and Tectonics	290	4.4	11.8
Volcanology	113	1.7	4.6
Subtotal	5,275	79.7	
Geophysics			
Geophysics	435	6.6	17.7
Petroleum Geophysics	319	4.8	13.0
Subtotal	754	11.4	
Petroleum Engineering	103	1.6	4.2
Mining Engineering	115	1.7	4.7
Engineering Geology and Engineering Geophysics	257	3.9	10.5
Hydrology and Hydrogeology	110	1.7	4.5
Total	6,614	100.0	

The most frequently held specialties are:

	% Response
Economic and Mining Geology	36.7
Petroleum Geology	33.6
General Geology and Earth Science	25.6
Geophysics	19.7
Stratigraphy	18.3

Respondents averaged 2.7 specialties held. This figure was derived by dividing the total specialties held (6,614) by the number of respondents to this question (2,458).

b. Specialty Practiced

Table 3 shows the responses for specialties currently practiced:

Table 3

Specialty Currently Practiced (Canada)

	Total Specialties	% of Category	% of Total
Geology			
Atmospheric Science	9	0.5	0.4
Economic and Mining Geology	587	33.7	23.9
Environmental Geology	9	0.5	0.4
General Geology and Earth Science	111	6.4	4.5
Geochemistry	83	4.8	3.4
Geomorphology	48	2.7	2.0
Marine Geology/Marine Geophysics	20	1.1	0.8
Mathematical Geology/Geostatistics	21	1.2	0.9
Mineralogy	57	3.3	2.3
Oceanography	1	0.1	0.0
Paleontology and Palynology	49	2.8	2.0
Petroleum Geology	563	32.3	22.9
Petrology	44	2.5	1.8
Planetology	0	0.0	0.0
Remote Sensing	18	1.0	0.7
Sedimentology	43	2.5	1.7
Soil Science	7	0.4	0.3
Stratigraphy	30	1.7	1.2
Structural Geology and Tectonics	38	2.2	1.5
Volcanology	3	0.2	0.1
Subtotal	**1,741**	**99.9**	**70.8**
Geophysics			
Geophysics	162	47.6	6.6
Petroleum Geophysics	178	52.4	7.2
Subtotal	**340**	**100.0**	**13.8**
Petroleum Engineering	**40**	**100.0**	**1.6**
Mining Engineering	**12**	**100.0**	**0.5**
Engineering Geology and Engineering Geophysics	**74**	**100.0**	**3.0**
Hydrology and Hydrogeology	**26**	**100.0**	**1.1**
Other[1]	**227**	**100.0**	**9.2**
Total	**2,460**	**100.0**	**100.0**

1 This category includes those working in non-geoscientific fields, the retired, and the unemployed.

The most frequently practiced specialties are:

	% Response
Geology, Geochemistry, and Other Earth Sciences (20 subcategories combined)	70.8
Petroleum Geophysics	7.2
Geophysics	6.6
Engineering Geology/Engineering Geophysics	3.0
Other	9.2

Within the category of geology, geochemistry, and other earth sciences, the most frequent specialties practiced are economic and mining geology (33.7%) and petroleum geology (32.3%). Those two specialties account for 66% of the 20 subcategories. It is likely, however, that many detailed specialties were reported under more general categories or according to the specific work performed. For example, a structural geologist may have chosen engineering geology as a more appropriate category.

c. Comparison of degrees earned with specialty practiced

Table 4 compares degrees earned with specialties practiced:

Table 4

Degrees Earned and Specialty Currently Practiced (Canada)

	Degree Totals[1]	Total Specialties Practiced[2]	Degree Coverage Ratio[3]
Geology			
Atmospheric Science	21	9	2.3
Economic and Mining Geology	607	587	1.0
Environmental Geology	20	9	2.2
General Geology and Earth Science	1,319	111	11.9
Geochemistry	183	83	2.2
Geomorphology	159	48	3.3
Marine Geology/Marine Geophysics	23	20	1.1
Mathematical Geology/Geostatistics	15	21	0.7
Mineralogy	92	57	1.6
Oceanography	14	1	14.0
Paleontology and Palynology	127	49	2.6
Petroleum Geology	175	563	0.3
Petrology	217	44	4.9
Planetology	9	0	-
Remote Sensing	12	18	0.7
Sedimentology	144	43	3.3
Soil Science	19	7	2.7
Stratigraphy	109	30	3.6
Structural Geology and Tectonics	126	38	3.3
Volcanology	22	3	7.3
Subtotal	**3,413**	**1,741**	**2.0**

1 Total Bachelor's, Master's, PhDs.

2 Excludes the 390 "Other" responses in Question III.

3 Degree totals divided by total specialties practiced total.

	Degree Totals	Total Specialties Practiced	Degree Coverage Ratio
Geophysics			
Geophysics	283	162	1.7
Petroleum Geophysics	27	178	0.1
Subtotal	**310**	**340**	**0.9**
Petroleum Engineering	**18**	**40**	**0.5**
Mining Engineering	**46**	**12**	**3.8**
Engineering Geology and Engineering Geophysics	**227**	**74**	**3.1**
Hydrology and Hydrogeology	**26**	**26**	**1.0**
Total	**4,040**	**2,233**	**1.8**

From Table 4 it is clear that in several fields more are practicing a specialty than have degrees in that specialty. Mathematical geology/geostatistics, petroleum geology, remote sensing, petroleum geophysics, and petroleum engineering are fields in which there appear to be more who practice those specialties than have degrees in those fields.

On the other hand, a degree in a particular specialty is not always translated directly into an employment specialty. More likely, academic training is the basis for training during employment. For all geoscientific specialties, the ratio of respondents' degree specialties to specialties practiced is slightly less than 2.0.

d. Comparison of specialty held with specialty practiced

Table 5 shows the comparison between specialties held (primary and secondary specialties combined) and specialties currently practiced:

Table 5

Geoscientific Specialty Held and Specialty Practiced (Canada)

	Specialties Held	Specialties Practiced	Coverage Ratio
Geology			
Atmospheric Science	20	9	2.2
Economic and Mining Geology	902	587	1.5
Environmental Geology	111	9	12.3
General Geology and Earth Science	628	111	5.7
Geochemistry	484	83	5.8
Geomorphology	160	48	3.3
Marine Geology/Marine Geophysics	95	20	4.7
Mathematical Geology/Geostatistics	97	21	4.6
Mineralogy	201	57	3.5
Oceanography	24	1	24.0
Paleontology and Palynology	109	49	2.2
Petroleum Geology	827	563	1.5
Petrology	261	44	5.9
Planetology	8	0	-
Remote Sensing	87	18	4.8
Sedimentology	352	43	8.2
Soil Science	56	7	8.0
Stratigraphy	450	30	15.0
Structural Geology and Tectonics	290	38	7.6
Volcanology	113	3	37.7
Subtotal	**5,275**	**1,741**	**3.0**

	Specialties Held	Specialties Practiced	Coverage Ratio
Geophysics			
Geophysics	435	162	2.7
Petroleum Geophysics	319	178	1.8
Subtotal	965	340	2.8
Petroleum Engineering	103	40	2.6
Mining Engineering	115	12	9.6
Engineering Geology and Engineering Geophysics	257	74	3.5
Hydrology and Hydrogeology	110	26	4.2
Total	6,825	2,233	3.1

The "coverage ratio" is the number of specialties held divided by the number of those currently working in that specialty. In almost every specialty category, there are more who are qualified in a specialty than are working in that specialty. On the average (the mean), there are 3.1 qualified professionals for every professional specialty. The two specialties with the lowest coverage ratio - economic and mining geology (1.5) and petroleum geology (1.5) - are ranked first and second as the most frequently held specialties and as the most frequently practiced specialties.

e. Employer Category and General Specialty Practiced

Table 6 shows a cross-tabulation between employer category and general specialty currently practiced:

Table 6

Employer Category and General Specialty Practiced (as percentage of total geoscientific population) (Canada)

	Geology, Geochemistry, Earth Science	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology
Academia	12.6	8.8	0.0	8.3	15.3	11.5
Government	16.4	10.9	2.6	8.3	9.7	11.5
Petroleum Industry	32.2	69.8	87.2	16.7	5.5	11.5
Mining/Minerals Industry	29.4	6.7	2.6	41.7	18.1	3.9
Engineering, Construction, and Consulting	2.4	0.9	0.0	16.7	37.5	53.9
Research and Related	3.2	0.9	2.6	0.0	5.5	0.0
Other Employers with Geoscientific Requirements	0.2	0.3	5.1	0.0	2.8	0.0
Employer with no Geoscientific Requirements	0.1	0.0	0.0	0.0	0.0	0.0
Not Employed	3.4	1.8	0.0	8.3	5.5	7.7
Total	**99.9**	**100.1**	**100.1**	**100.0**	**99.9**	**100.0**

The petroleum industry employs 32.2% of the geologists, geochemists, and other earth scientists, 69.8% of the geophysicists, and 87.2% of the petroleum engineers.

Government employs 16.4% of the geologists, geochemists, and other earth scientists, 9.7% of the engineering geologists, and 11.5% of the hydrologists/hydrogeologists.

Engineering, construction and geoscientific consulting companies employ 37.5% of the engineering geologists and 53.9% of the hydrologists/hydrogeologists.

f. Occupational Objective and Specialty Practiced

Table 7 shows a cross-tabulation between occupational objective and specialty practiced:

Table 7

Occupational Objective and Specialty Practiced (as percentage of total geoscientific population)[1] (Canada)

	Geology, Geochemistry, Earth Science	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology
Finding and Developing Oil and Gas	35.7	71.9	84.6	16.7	7.1	16.0
Finding and Developing Other Resources	36.8	8.5	0.0	50.0	20.0	28.0
Geotechnical Applications	2.1	2.3	0.0	16.7	64.3	44.0
Public Policy Administration	2.2	0.0	5.1	0.0	0.0	0.0
Geoscientific Education, Basic Research and Communications	21.4	15.3	0.0	8.3	8.6	12.0
Other Geoscientific Applications	1.5	2.1	7.7	8.3	0.0	0.0
Non-geoscientific Related	0.2	0.0	2.6	0.0	0.0	0.0
Total	**99.9**	**100.1**	**100.0**	**100.0**	**100.0**	**100.0**

Finding and developing oil and gas is the occupational focus of 35.7% of the geologists, geochemists, and other earth scientists, 71.9% of the geophysicists, and 84.6% of the petroleum engineers.

Finding and developing other resources occupies 36.8% of the geologists, geochemists, and other earth scientists, 50.0% of the mining engineers, and 28.0% of the hydrologists/hydrogeologists.

Geotechnical applications are the occupational objective of 16.7% of the mining engineers, 64.3% of the engineering geologists, and 44.0% of the hydrologists/hydrogeologists.

Geoscientific education, basic research and communications occupy 21.4% of the geologists, geochemists, and other earth scientists, 15.3% of the geophysicists, mining engineers, and 12.0% of the hydrologists/hydrogeologists.

1 Percentages are exclusive of "Not Currently Employed" category.)

3. Employment (Question IV)

a. Employer Category

Table 8 and Figure a show the survey response for the 9 major categories of employers (including "not employed"):

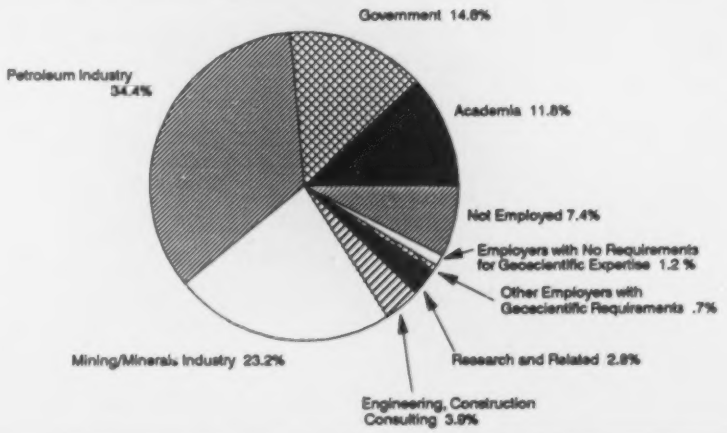
Table 8

Current Employer Category (1986)
(Canada)

	Number of Responses	% of Total
Academia	308	11.8
Government	380	14.6
Petroleum Industry	896	34.4
Mining/Minerals Industry	603	23.2
Engineering, Construction, Consulting	101	3.9
Research and Related	72	2.8
Other Employers with Geoscientific Requirements	17	0.7
Employers with No Requirements for Geoscientific Expertise	32	1.2
Not Employed	193	7.4
Total	**2,602**	**100.0**

Slightly more than one-third of the respondents are employed by the petroleum industry. The mining/minerals industry employs the next largest percentage of the profession, followed by those in government.

Figure a
Current Employer Category


Government 14.6%
Petroleum Industry 34.4%
Academia 11.8%
Not Employed 7.4%
Employers with No Requirements for Geoscientific Expertise 1.2 %
Other Employers with Geoscientific Requirements .7%
Mining/Minerals Industry 23.2%
Research and Related 2.8%
Engineering, Construction Consulting 3.9%

b. Employer Category (all subcategories)

Table 9 presents a complete breakdown of employer category and all subcategories:

Table 9

Current Employer Category (1986), with subcategories (Canada)

Employer Category	Number of Responses	% of Category	% of Total
Academia			
Secondary School	7	2.3	0.3
Junior College/Technical	12	3.9	0.5
College/University	289	93.8	11.1
Subtotal	**217**	**100.0**	**11.9**
Government			
Federal/National	208	54.7	8.0
State/Local	168	44.2	6.5
Military	0	0.0	0.0
Other	4	1.1	0.2
Subtotal	**358**	**100.0**	**14.7**
Petroleum Industry			
Integrated Petroleum Company	347	38.7	13.3
Independent Exploration and Production Company	329	36.7	12.6
Drilling Contractor	0	0.0	0.0
Oil Field Service	52	5.8	2.0
Consultant	132	14.7	5.1
Other	36	4.0	1.4
Subtotal	**896**	**99.9**	**34.4**
Mining or Minerals Industry			
Exploration and/or Producing Company	365	60.5	14.0
Consultant	227	37.7	8.7
Other	11	1.8	0.4
Subtotal	**603**	**100.0**	**23.1**
Engineering, Construction, Consulting			
Construction and/or Engineering Firm	40	39.6	1.5
Geoscientific Studies Consultant	54	53.5	2.1
Other	7	6.9	0.3
Subtotal	**101**	**100.0**	**3.9**
Research and Related			
Research Institute or Laboratory	39	54.2	1.5
Library	4	5.5	0.2
Museum	17	23.6	0.7
Other	12	16.7	0.5
Subtotal	**72**	**100.0**	**2.9**

Employer Category	Number of Responses	% of Category	% of Total
Other Employers with Geoscientific Requirements			
Banking/Financial	6	35.3	0.2
Equipment Manufacturers	3	17.7	0.1
Law	0	0.0	0.0
Journalism/Media	4	23.5	0.2
Other	4	23.5	0.2
Subtotal	17	100.0	0.7
Employers with No Requirements for Geoscientific Expertise			
By your choice	9	28.1	0.3
By necessity, but want to return to geoscientific position	15	46.9	0.6
By necessity, but do not want to return to geoscientific position	8	25.0	0.3
Subtotal	32	100.0	1.2
Not Employed			
Retired	85	44.0	3.3
Unemployed, but want to return to geoscientific position	51	26.4	2.0
Unemployed, but do not want to return to geoscientific position	10	5.2	0.4
Student	42	21.8	1.6
Other	5	2.6	0.2
Subtotal	193	100.0	7.5
Total	3,096		100.3

c. Not Employed

The survey response in this category shows that 3.3% are retired, and a total of 4.2% are unemployed. Most of the unemployed wish to return to geoscientific employment.

d. Comparison of Employer Category and Specialty Practiced

Table 10 shows a cross-tabulation between the major employer categories and specialty practiced:

Table 10

Employer Category and Specialty Practiced (as percentage of total geoscientists employed) (Canada)

	Geology, Geochemistry, Earth Science	Geophysics	Petroleum Engineering	Mining Engineering	Engineering Geology	Hydrology/ Hydrogeology	Total
Academia	82.6	11.6	0.0	0.4	4.3	1.2	100.1
Government	85.0	11.3	0.3	0.3	2.1	0.9	99.9
Petroleum Industry	66.0	28.8	4.1	0.2	0.5	0.4	100.0
Mining/Minerals Industry	92.1	4.3	0.2	0.9	2.4	0.2	100.1
Engineering, Construction, Consulting	47.1	3.5	0.0	2.3	31.0	16.1	100.0
Research and Related	87.1	4.8	1.6	0.0	6.5	0.0	100.0
Other Employers with Geoscientific Requirements	44.4	11.1	22.2	0.0	22.2	0.0	99.9
Employer with No Requirements for Geosci. Expertise	100.0	0.0	0.0	0.0	0.0	0.0	100.0
Retired and Unemployed	81.7	8.5	0.0	1.4	5.5	2.8	99.9

- Nearly 83% of those geoscientists working in academia are geologists, geochemists, and other earth scientists.
- Of those geoscientists working in government, about 11.3% are geophysicists.
- Of those geoscientists working in the mining/minerals industry, the great majority (92.1%) are geologists, geochemists, and other earth scientists.
- Of those geoscientists who work in research and related activities, 87.1% are geologists, geochemists, and other earth scientists.
- Among those who work for other employers with geoscientific requirements, 44.4% are geologists, geochemists, and other earth scientists.

4. Occupational Objective (Question VI)

a. Major Categories of Occupational Objective

The major categories of occupational objective for the survey population are shown in Table 11:

Table 11

Occupational Objective (Canada)

	Number of Responses	% of Total
Finding and developing oil and gas	971	39.5
Finding and developing other resources	744	30.2
Geotechnical applications	116	4.7
Public policy administration	60	2.4
Geoscientific education, basic research and communications	466	18.9
Other geoscientific application	49	2.0
Non-geoscientific related	54	2.2
Total	**2,460**	**99.9**

About 70% of the survey population is involved in finding and developing natural resources.

b. Employer Category and Occupational Objective

Table 12 presents a cross-tabulation of major employer categories and occupational objective:

Table 12

Employer Category and Occupational Objective (as percentage of total geoscientists employed) (Canada)

	Finding/ Developing Oil/Gas	Finding/ Developing Other Resources	Geo-technical Appli-cations	Public Policy Admin-istration	Education/ Research/ Commun-ications	Other	Non-Geoscientific	Total
Academia	2.2	3.6	2.9	0.4	89.9	0.0	1.1	100.1
Government	8.5	25.6	7.9	14.2	35.1	7.1	1.6	100.0
Petroleum Industry	96.5	0.8	0.2	0.1	0.5	0.6	1.4	100.1
Mining/Minerals Industry	1.6	96.1	1.1	0.2	0.7	0.2	0.2	100.1
Engineering, Construction, Consulting	7.5	29.0	51.6	0.0	6.5	3.2	2.2	100.0
Research and Related	27.1	12.9	8.6	0.0	47.1	2.9	1.4	100.0
Other Employers with Geoscientific Requirements	0.0	25.0	8.3	0.0	25.0	33.3	8.3	99.9
Employers with No Geoscientific Requirements	6.9	10.3	0.0	0.0	0.0	0.0	82.8	100.0

c. Employer Category and Detailed Occupational Focus

- For academia, 55.0% are involved in teaching, and 33.8% do basic research.
- Within government, 30.8% are involved in basic research, 17.7% focus on finding and developing metals, and 14.2% are concerned with public policy administration.
- For the petroleum industry, 70.9% focus on exploration evaluation, 9.6% are involved in field development and production, and 9.5% work on seismic data acquisition and processing.
- For the mining/minerals industry, 88.6% are concerned with metals, 5.1% focus on industrial minerals and water, and 2.5% are involved with coal.
- Within engineering, construction and geoscientific consulting firms, 34.4% work in construction and civil development, 12.9% focus on environmental and health investigations, and 2.2% are involved with hazard assessment.
- Among those working in research and related employment, 27.1% focus on oil and gas, and 20.0% work in basic research.

5. Occupational Level (Question V)

a. Occupational level

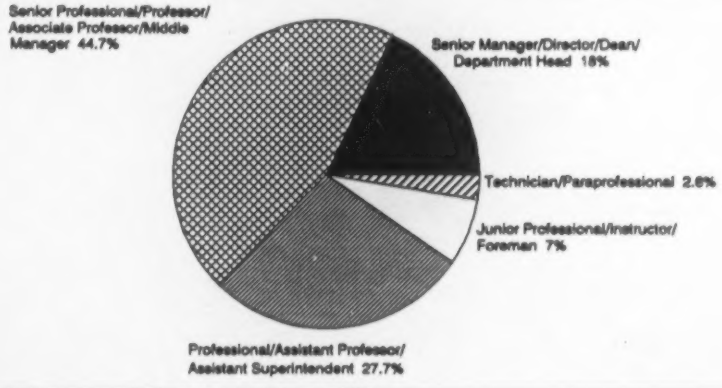
Table 13 and Figure b show the occupational levels for the total survey population:

Table 13

Occupational Level (Canada)

	Number of Responses	% of Total
1) Senior Manager/Director/Dean/Department Head	432	18.0
2) Senior Professional/Professor/Associate Professor/Middle Manager	1,076	44.7
3) Professional/Assistant Professor/Assistant Superintendent	667	27.7
4) Junior Professional/Instructor/Foreman	168	7.0
5) Technician/Paraprofessional	62	2.6
Total	**2,405**	**100.0**

Figure b
Occupational Level


Senior Professional/Professor/ Associate Professor/Middle Manager 44.7%
Senior Manager/Director/Dean/ Department Head 18%
Technician/Paraprofessional 2.6%
Junior Professional/Instructor/ Foreman 7%
Professional/Assistant Professor/ Assistant Superintendent 27.7%

Most respondents are in the middle to upper range of occupational levels. Nearly 63% of the total survey population hold positions at the senior professional level or above. That percentage is generally reflected for all employer categories and for all geoscientific specialties.

b. Employer Category and Occupational Level

Table 14 shows the general categories of employer and occupational levels:

Table 14

Employer Category and Occupational Level (as percentage of total employer category) (Canada)

	Occupational Level[1]					
Employer Category	**1**	**2**	**3**	**4**	**5**	**Total**
Academia	12.8	63.4	13.6	8.1	2.2	100.1
Government	9.0	46.8	38.4	3.2	2.6	100.0
Petroleum Industry	17.2	40.6	32.0	8.0	2.2	100.0
Mining/Minerals Industry	26.3	42.7	24.5	5.7	0.9	100.1
Engineering, Construction, Consulting	32.9	36.5	23.5	4.7	2.4	100.0
Research and Related	13.6	50.0	24.2	3.0	9.1	99.9
Other Employers with Geoscientific Requirements	9.1	54.5	36.4	0.0	0.0	100.0
Employers with No Geoscientific Requirements	18.5	14.8	14.8	18.5	33.3	100.0

- Of the geoscientists who work for the federal government 7.4% are at the top occupational level, while 11.0% of those working for provincial government are at that level.
- Of the geoscientists who work for integrated petroleum companies 5.7% are at the top occupational level, while 20.5% of those working for independent petroleum companies are at that level.
- The highest percentage of employed geoscientists at the top occupational level occurs among consultants working for engineering, construction, and consulting firms - 38.3%; the next highest percentage occurs among drilling contractors and oil field service employees - 34.1%.
- For the second highest occupational level, the highest concentration occurs among those working at colleges and universities (67.3%), followed by those working for other employers with geoscience requirements (54.5%).

1 1) Senior Manager/Director/Dean/Department Head
2) Senior Professional/Professor/Associate Professor/Middle Manager
3) Professional/Assistant Professor/Assistant Superintendent
4) Junior Professional/Instructor/Foreman
5) Technician/Paraprofessional

c. Specialty Practiced and Occupational Level

Table 15 shows the general specialty-practiced categories and occupational levels:

Table 15

Specialty Practiced and Occupational Level (as percentage of total specialty practiced) (Canada)

	Occupational Level[1]					
Specialty Practiced	**1**	**2**	**3**	**4**	**5**	**Total**
Geology, Geochemistry, and Other Earth Science	17.6	45.6	28.4	6.6	1.8	100.0
Geophysics	13.1	45.0	33.4	6.4	2.1	100.0
Petroleum Engineering	25.0	38.9	25.0	8.3	2.8	100.0
Mining Engineering	20.0	60.0	10.0	10.0	0.0	100.0
Engineering Geology	22.2	47.2	19.4	6.9	4.2	99.9
Hydrology/Hydrogeology	28.6	52.4	9.5	4.8	4.8	100.1

- Hydrologists/hydrogeologists show the highest percentage of those at the top occupational level (28.6%), followed by petroleum engineers (25.0%) and engineering geologists (22.2%).
- At the second highest occupational level are mining engineers (60%), hydrologists/hydrogeologists (52.4%), and engineering geologists (47.2%).
- For the top two occupational levels combined, hydrologists/hydrogeologists rank first (81.0%), followed by mining engineers (80.0%) and engineering geologists (69.4%).

1 1) Senior Manager/Director/Dean/Department Head
2) Senior Professional/Professor/Associate Professor/Middle Manager
3) Professional/Assistant Professor/Assistant Superintendent
4) Junior Professional/Instructor/Foreman
5) Technician/Paraprofessional

6. Age (Question IV)

a. Age Distribution for Total Geoscience Population

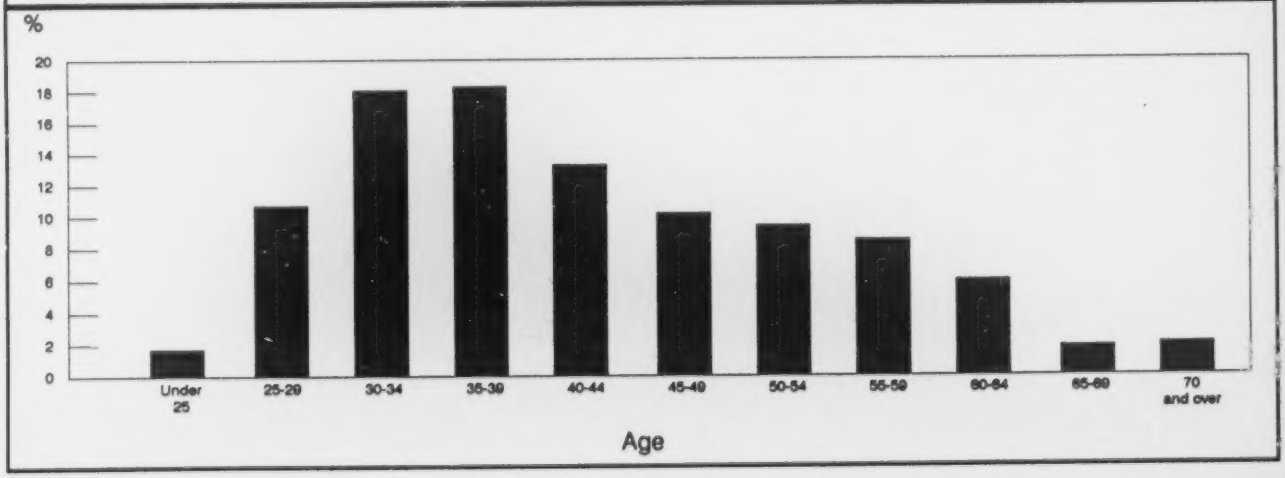
Age distribution of the geoscience population is one of the most consequential factors for determining employment trends. Table 16 and Figure c summarize the age distribution for the survey population:

Table 16

Age Distribution (Canada)

	Number of Responses	% of Total
Under 25	41	1.7
25 - 29	260	10.7
30 - 34	440	18.1
35 - 39	446	18.3
40 - 44	324	13.3
45 - 49	249	10.2
50 - 54	230	9.4
55 - 59	206	8.5
60 - 64	147	6.0
65 - 69	43	1.8
70 and over	49	2.0
Total	**2,435**	**100.0**

Figure c
Age Distribution



Unlike the age distribution for the U.S. geoscience population, the Canadian age distribution is not bimodal.

When age categories are cumulatively combined, a more general interpretation of the age distribution is possible. Table 17 presents a few of these combinations:

Table 17

Age Distribution in Cumulative Combinations (percentages combined) (Canada)

Age	% less than	% greater than
25	1.7	98.3
30	12.4	87.6
35	30.5	69.5
40	48.8	51.2
45	62.1	37.9
50	72.3	27.7
55	81.7	18.3
60	90.2	9.8
65	96.2	3.8
70	98.0	2.0

b. Age Distribution and Employer Category

Within employer categories, the age distribution varies widely, as shown in Table 18:

Table 18

Age Distribution and Employer Category (as percentage of employer categories) (Canada)

	Age		
Employer Category	% Under 35	% 35-49	% 50 & Over
Academia	11.4	50.2	38.4
Government	20.0	50.0	30.0
Petroleum Industry	46.1	35.5	18.4
Mining/Minerals Industry	23.5	50.4	26.1
Engineering, Construction, Consulting	23.5	48.2	28.2
Research and Related	30.9	39.7	29.4
Other Employers with Geoscientific Requirements	41.7	50.0	8.3
Employers with No Geoscientific Requirements	51.6	35.5	12.9
Not Employed	31.3	16.5	52.2
Population Total [1]	**30.9**	**41.9**	**27.2**

1 The terms "population total" and "total population" refer to the survey's geoscience population.

Among the employed, academia has the oldest population with 38% being age 50 and over, and 11% under age 35.

Employers with no requirements for geoscientific expertise, however, have the youngest population, with 52% being under age 35.

The mining/minerals industry shows the largest percentage in the age group 35 - 49 (50.4%).

Within the petroleum industry, there are marked differences, particularly between the integrated companies and consultants, as shown in Table 19:

Table 19

Age Distribution in the Petroleum Industry (as percentage of employer category) (Canada)

	Age		
	% Under 35	% 35-49	% 50 & Over
Integrated companies	54.8	33.4	11.7
Independent companies	45.5	35.2	19.4
Drilling Contractor/Oil field service	52.1	41.7	6.3
Consultants	19.2	38.3	42.5
Other	53.1	40.6	6.3
Total Population	**46.1**	**35.5**	**18.4**

c. Age Distribution and Occupational Category

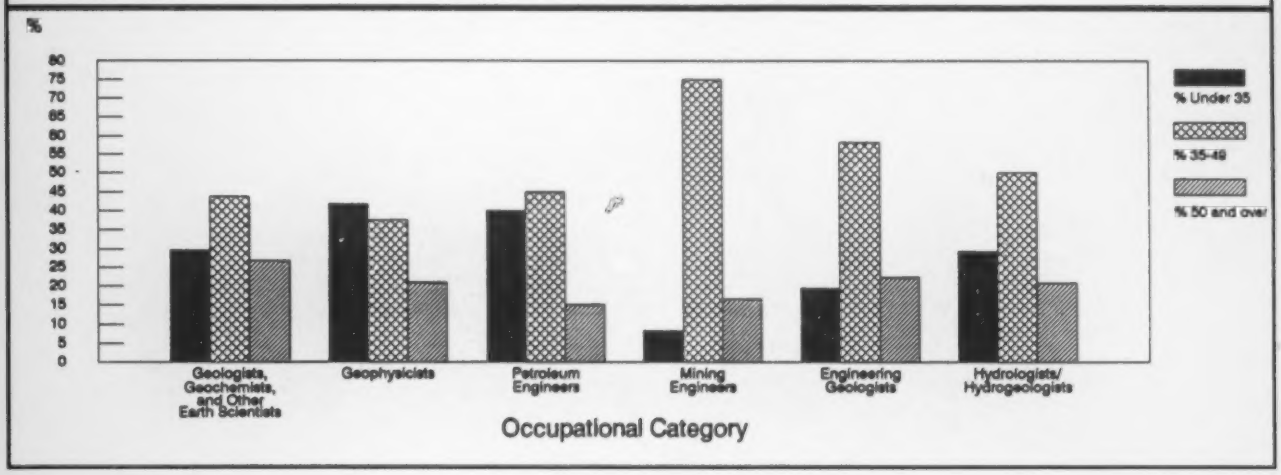
The age distribution for occupational categories is shown in Table 20 and Figure d:

Table 20

Age Distribution and Occupational Category (as percentage of occupational categories) (Canada)

	Age		
Occupational Category	% Under 35	% 35-49	% 50 & Over
Geologists, Geochemists, and Other Earth Scientists	29.5	43.7	26.8
Geophysicists	41.6	37.4	21.0
Petroleum Engineers	40.0	45.0	15.0
Mining Engineers	8.3	75.0	16.7
Engineering Geologists	19.4	58.2	22.4
Hydrologists/Hydrogeologists	29.2	50.0	20.8
Total Population	**31.1**	**43.5**	**25.4**

Figure d
Age Distribution and Occupational Category



Engineering geologists are the oldest group, with 19.4% under the age of 35 and 22.4% being age 50 and over.

Geophysicists are the youngest group with 41.6% under the age of 35 and 21.0% being age 50 and over.

7. Years of Experience (Question VII)

a. Years of Experience for Total Geoscience Population

For the total geoscience population, the years of experience are shown in Table 21 and Figure e:

Table 21

Years of Experience (Canada)

	Number of Responses	% of Total
Less than 5	258	10.1
5 - 9	486	19.0
10 - 14	464	18.1
15 - 19	396	15.4
20 - 24	252	9.8
25 - 29	248	9.7
30 and more	460	17.9
Total	**2,564**	**100.0**

Figure e
Years of Experience

The years of experience pattern shows a bimodal distribution.

The heaviest concentrations occur among those who have been working for 5-9 years (19.0%) and those who have been working for 10-14 years (18.1%). Of the total population 47.2% has worked for 14 years or less.

b. Years of Experience and Employer Category

The years of experience pattern varies widely within the different categories of employer. Table 22 shows the years of experience according to three groupings of years of experience:

Table 22

Years of Experience and Employer Category
(as percentage of employer categories)
(Canada)

	Years of Experience		
Employer Category	**% Less than 5**	**% 5 - 14**	**% 15 and more**
Academia	6.7	24.7	68.6
Government	7.3	34.5	58.2
Petroleum Industry	13.0	49.7	37.3
Mining/Minerals Industry	5.1	31.7	63.2
Engineering, Construction, Consulting	7.5	37.6	54.8
Research and Related	11.5	34.6	53.9
Other Employers with Geoscientific Requirements	0.0	66.7	33.3
Employers with No Geoscientific Requirements	43.3	36.7	20.0
Not Employed	18.0	23.8	58.2
Total Population	**10.1**	**37.6**	**52.3**

Among geoscientific employers, the petroleum industry, and research and related employers show 13.0% and 11.5% of their employees with less than 5 years' experience. Academia, government, the mining/minerals industry, and other employers with geoscientific requirements employ relatively few inexperienced personnel. Employers with no geoscientific requirements

employ a very large number (43.3%) of personnel with less than 5 years' experience. That figure may reflect the difficulty in recent years for new geoscientists to find sustained employment in the profession.

c. Years of Experience and Occupational Category

Table 23 shows the years of experience for three groupings of years of experience and occupational category:

Table 23

Years of Experience and Occupational Category (as percentage of total occupational categories) (Canada)

	Years of Experience		
Occupational Category	**% Less than 5**	**% 5 - 14**	**% 15 and more**
Geologists, Geochemists, and other Earth Scientists	8.3	39.0	52.7
Geophysicists	14.1	38.3	47.6
Petroleum Engineers	10.0	42.5	47.5
Mining Engineers	8.3	25.0	66.7
Engineering Geologists	5.6	30.6	63.9
Hydrologists/Hydrogeologists	15.4	38.5	46.1
Total Population	**9.3**	**38.6**	**52.1**

Geophysicists and hydrologists/hydrogeologists have the highest proportion of those with less than 5 years' experience. Mining engineers and engineering geologists show the highest percentages of employees who have worked for 15 years or more.

8. Number of Companies/Institutions Worked For (Question VIII)

a. Number of Companies/Institutions Worked For - For Total Geoscience Population

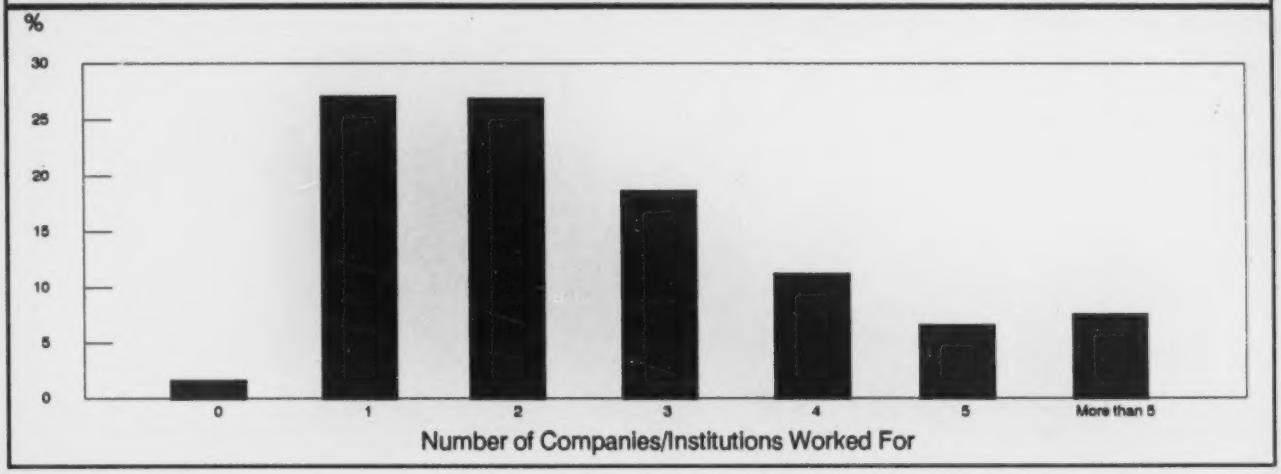
As a measure of the mobility of the geoscience population, respondents were asked to indicate the number of companies or institutions for which they have worked. Table 24 and Figure f show the breakdown for the total geoscience population:

Table 24

Number of Companies/Institutions Worked For (Canada)

	Number of Responses	**% of Total**
0	40	1.7
1	686	27.1
2	681	26.9
3	472	18.7
4	285	11.3
5	170	6.7
More than 5	193	7.6
Total	**2,530**	**100.0**

Figure f
Number of Companies/Institutions Worked For



More than half of the survey population has worked for only one or two companies/institutions, and nearly 75% of the total has worked for no more than three.

b. Number of Companies/Institutions Worked For and Employer Category

Table 25 shows the number of companies/institutions worked for and employer category. Those who indicated working for no companies were removed from the total:

Table 25

Number of Companies/Institutions Worked For and Employer Category (as percentage of total employer categories) (Canada)

	1	2	3	4	5	More than 5	Total
Academia	25.6	39.1	19.0	9.5	4.0	2.9	100.1
Government	33.9	27.9	19.7	7.9	4.7	6.0	100.1
Petroleum Industry	32.8	24.5	16.1	12.6	8.1	6.0	100.1
Mining/Minerals Industry	18.2	25.3	22.2	14.4	6.7	13.3	100.1
Engineering, Construction, Consulting	20.7	32.6	28.8	8.7	5.4	9.8	100.0
Research and Related	15.9	34.8	24.6	14.5	4.4	5.8	100.0
Other Employers with Geoscientific Requirements	0.0	25.0	33.3	25.0	16.7	0.0	100.0
Employers with No Geoscientific Requirements	33.3	29.6	18.5	3.7	7.4	7.4	99.9
Not Employed	31.5	21.8	18.2	7.3	11.5	9.7	100.0
Population Total	**27.6**	**27.3**	**19.1**	**11.4**	**6.9**	**7.7**	**100.0**

Geoscientists working for the government have worked for the fewest employers, followed by those working for employers with no geoscientific requirements. Those working for other employers with geoscientific requirements are the most mobile, with 41.7% working for 4 or more companies/institutions. The next most mobile category is the mining/minerals industry (34.4%), followed by the petroleum industry (26.7%).

As an example of the variations within employer categories, for the petroleum industry 51% of those employed by the integrated petroleum companies have worked for only one company, while only 13% have worked for 4 or more companies. On the other hand, 19% of those working for independent petroleum companies have worked for only one company, while 36% have worked for 4 or more. Among petroleum consultants, 11% have worked for only one company, while 45% have worked for 4 or more.

c. Number of Companies/Institutions Worked For and Occupational Category

Table 26 cross-tabulates the number of companies/institutions worked for and occupational category. Those who indicated working for no companies/institutions were removed from the total:

Table 26

Number of Companies/Institutions Worked For and Occupational Category (as percentage of total occupational categories) (Canada)

	1	2	3	4	5	More than 5	Total
Geologists, Geochemists, and Other Earth Scientists	26.7	27.1	22.6	11.5	6.6	9.1	100.1
Geophysicists	34.7	28.9	22.7	10.5	7.9	2.3	100.0
Petroleum Engineers	25.0	25.0	16.5	12.5	2.5	10.0	100.0
Mining Engineers	0.0	30.0	18.0	30.0	0.0	10.0	100.0
Engineering Geologists	17.1	28.6	22.1	17.1	4.3	4.3	100.0
Hydrologists/Hydrogeologists	11.5	38.5	30.4	7.7	7.7	3.9	100.1
Population Total	**27.3**	**27.5**	**9.2**	**11.6**	**6.6**	**7.8**	**100.0**

Mining engineers are the most mobile, with 40.0% having worked for 4 or more companies, followed by geologists, geochemists, and other earth scientists at 27.2%. Hydrologists/ hydrogeologists and geophysicists are the least mobile with 19.3% and 20.7% respectively having worked for 4 or more companies.

9. Income (Question IX)

a. Annual Income for Total Geoscience Population

Total annual income for the total survey population is shown in Table 27 and Figure g:

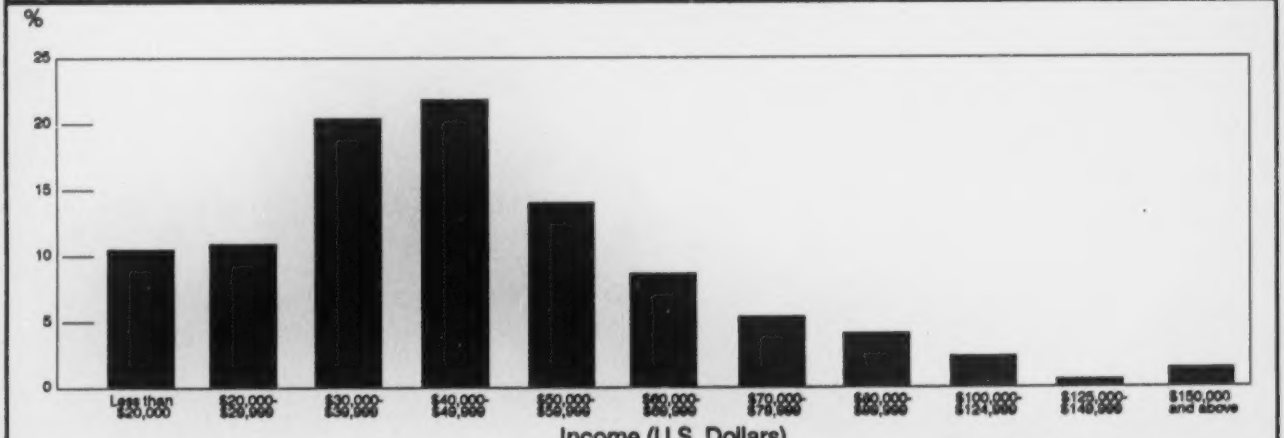
Table 27

Total Current Annual Employment Income (U.S. Dollars) (Canada)

	Number of Responses	% of Total
Less than $20,000	246	10.5
$20,000 - $29,999	257	10.9
$30,000 - $39,999	481	20.5
$40,000 - $49,999	514	21.9
$50,000 - $59,999	329	14.0
$60,000 - $69,999	201	8.6
$70,000 - $79,999	125	5.3
$80,000 - $99,999	95	4.1
$100,000 - $124,999	54	2.3
$125,000 - $149,999	11	0.5
$150,000 and above	33	1.4
Total	**2,346**	**100.0**

The median annual income for the total survey population was approximately $44,000.

Figure g
Total Current Annual Employment Income



b. Annual Income and Employer Category

Table 28 shows the approximate median annual income for the major categories of employer:

Table 28

Approximate Median Annual Employment Income and Employer Category (Canada)

	Approximate Median
Academia	$44,000
Government	$42,000
Petroleum Industry	$50,000
Mining/Minerals Industry	$43,000
Engineering, Construction, Consulting	$39,000
Research and Related	$42,000
Other Employers with Geoscientific Requirements	$38,000
Employers with No Geoscientific Requirements	< $20,000
Not Employed	< $20,000
Median	**$44,000**

The highest approximate median income is earned by those working for the petroleum industry, a category that comprises 33.5% of the total geoscientific population.

Within employer categories there are some interesting variations:

- The federal government pays more than provincial government; for federal geoscientists, 60.2% earn between $40,000 and $60,000, while for state/local geoscientists, the corresponding percentage is 33.5%.
- Within the petroleum industry, the median salary for those working for integrated petroleum companies is $55,000, while for independent petroleum companies, the median income is $60,000.

c. Annual Income and Occupational Category

Table 29 shows the approximate median annual income for the major occupational categories:

Table 29

Approximate Median Annual Employment Income and Occupational Category (Canada)

	Approximate Median
Geologists, Geochemists, and other Earth Scientists	$44,000
Geophysicists	$47,000
Petroleum Engineers	$48,000
Mining Engineers	$46,000
Engineering Geologists	$47,000
Hydrologists/Hydrogeologists	$41,000
Median	**$44,000**

The complete cross-tabulation of income and occupational category is found in Appendix d-11.

10. Primary Work Location (Question XI)

a. Primary Work Location for Total Geoscience Population

Table 30 shows the primary work location for the total survey population:

Table 30

Primary Work Location (Canada)

	Number of Responses	% of Total
British Columbia	241	10.8
Yukon and Northwest Territories	88	3.9
Prairies	1,035	46.3
Ontario and Quebec	657	29.4
Atlantic Provinces	176	7.9
Total	**2,197**	**98.3**
United States	14	0.6
Other (includes Central & South America, overseas)	23	1.0
Total	**2,234**	**99.9**

Nearly half (46.3%) of the population is located in the prairie provinces. Ontario and Quebec are the next most populous areas, followed by British Columbia, the Atlantic Provinces, and the Yukon and Northwest Territories.

b. Primary Work Location and Employer Category

Table 31 shows the primary work location for the major employer categories:

Table 31

Primary Work Location and Employer Category (as percentage of total employer categories) (Canada)

	British Columbia	Yukon/NW Territories	Prairies	Ontario/ Quebec	Atlantic Provinces	U.S.	Other	Total
Academia	10.9	1.9	24.4	46.6	15.0	0.0	1.1	99.9
Government	12.3	10.3	12.9	46.0	17.9	0.0	0.6	100.0
Petroleum Industry	1.5	0.9	93.9	1.0	1.4	0.5	0.8	100.0
Mining/Minerals Industry	22.5	5.6	13.4	49.0	6.7	1.6	1.3	100.1
Engineering, Construction, Consulting	20.2	2.4	17.9	50.0	5.9	0.0	3.6	100.0
Research and Related	4.5	3.0	38.8	38.8	14.9	0.0	0.0	100.0
Other Employers with Geoscientific Requirements	0.0	0.0	30.0	60.0	10.0	0.0	0.0	100.0
Employers with No Geoscientific Requirements	20.7	3.5	24.1	31.0	13.8	3.5	3.5	100.1
Not Employed	13.2	5.9	43.4	28.3	7.2	1.3	0.7	100.0

The most populous regions for each employer category are as follows:

Academia	Ontario and Quebec
Government	Ontario and Quebec
Petroleum Industry	Prairies
Mining/Minerals Industry	Ontario and Quebec
Engineering, Construction, Consulting	Ontario and Quebec
Research and Related	Prairies, Ontario and Quebec
Other Employers with Geoscientific Requirements	Ontario and Quebec
Employers with No Geoscientific Requirements	Ontario and Quebec
Not Employed	Prairies

c. Primary Work Location and Occupational Category

Table 32 shows the primary work location for the major occupational categories:

Table 32

Primary Work Location and Occupational Category (as percentage of occupational categories) (Canada)

	British Columbia	Yukon/NW Territories	Prairies	Ontario/ Quebec	Atlantic Provinces	U.S.	Other	Total
Geologists, Geochemists and Other Earth Scientists	11.7	4.1	43.0	30.9	8.8	0.6	0.9	100.0
Geophysicists	6.0	1.6	71.4	15.2	4.1	0.0	1.6	99.9
Petroleum Engineers	5.5	0.0	94.4	0.0	0.0	0.0	0.3	99.9
Mining Engineers	20.0	0.0	30.0	30.0	20.0	0.0	0.0	100.0
Engineering Geologists	17.7	1.5	29.4	47.1	2.9	0.0	1.5	100.1
Hydrologists/Hydrogeologists	0.0	8.7	26.1	60.9	0.0	0.0	4.3	100.0

The Canadian Prairies are the most populous primary work location for three occupational categories: 1)geologists, geochemists, and other earth scientists, 2) geophysicists, and 3) petroleum engineers. Mining engineers are equally concentrated in the Prairies and in Ontario and Quebec. Engineering geologists and hydrologists/hydrogeologists are found mostly in Ontario and Quebec.

11. Race/Ethnic Origin (Question XII)

a. Race/Ethnic Origin for Total Geoscience Population

Table 33 shows the race/ethnic origin for the total survey population:

Table 33

Race/Ethnic Origin (Canada)

	Number of Respondents	% of Total
American Indian/Alaskan Native	8	0.3
Arab	6	0.3
Black	7	0.3
Caucasian	2,243	96.0
Hispanic	5	0.2
Asian/Pacific Islander	68	2.9
Total	**2,337**	**100.0**

b. Race/Ethnic Origin and Employer Category

Table 34 shows the race/ethnic origin for the major employer categories:

Table 34

Race/Ethnic Origin and Employer Category (as percentage of employer categories) (Canada)

	Caucasian	Non-Caucasian
Academia	93.7	6.3
Government	95.1	4.9
Petroleum Industry	96.5	3.5
Mining/Minerals Industry	96.5	3.5
Engineering, Construction, Consulting	94.7	5.3
Research and Related	96.9	3.1
Other Employers with Geoscientific Requirements	100.0	0.0
Employers with No Geoscientific Requirements	89.7	10.3
Not Employed	97.1	2.9
Population Total	**95.9**	**4.1**

c. Race/Ethnic Origin and Occupational Category

Table 35 shows the race/ethnic origin for the major occupational categories:

Table 35

Race/Ethnic Origin and Occupational Category (as percentage of occupational categories) (Canada)

	Caucasian	Non-Caucasian
Geologists, Geochemists, and other Earth Scientists	95.9	4.1
Geophysicists	95.9	4.1
Petroleum Engineers	94.6	5.4
Mining Engineers	88.9	11.1
Engineering Geologists	98.4	1.6
Hydrologists/Hydrogeologists	95.2	4.8

12. Gender (Question XV)

a. Gender for Total Survey Population

For the total survey population responding to this question, 2,252 (91.8%) are male, 200 (8.2%) are female (Total number = 2,452).

b. Gender and Employer Category

Table 36 shows the gender percentages for the major employer categories:

Table 36

Gender and Employer Category (as percentage of employer categories) (Canada)

	Male	Female
Academia	90.4	9.6
Government	91.5	8.5
Petroleum Industry	91.9	8.1
Mining/Minerals Industry	94.5	5.5
Engineering, Construction, Consulting	86.5	13.5
Research and Related	87.0	13.0
Other Employers with Geoscientific Requirements	83.3	16.7
Employers with No Geoscientific Requirements	73.3	26.7
Not Employed	89.6	10.4
Total Population	**91.8**	**8.2**

c. Gender and Occupational Category

Table 37 shows the gender percentages for occupational categories:

Table 37

Gender and Occupational Category (as percentage of occupational categories) (Canada)

	Male	Female
Geologists, Geochemists, and other Earth Scientists	91.5	8.5
Geophysicists	93.7	6.3
Petroleum Engineers	97.5	2.5
Mining Engineers	100.0	0.0
Engineering Geologists	100.0	0.0
Hydrologists/Hydrogeologists	91.7	8.3

13. Citizenship (Question XVI)

a. Citizenship for Total Survey Population

For the total survey population, 93.0% are Canadian citizens, 3.0% are U.S. citizens, and 3.9% are Other.

b. Citizenship and Employer Category

Table 38 shows citizenship and major employer categories:

Table 38

Citizenship and Employer Category (as percentage of employer categories) (Canada)

	Canada	U.S.	Other
Academia	82.9	8.0	9.0
Government	94.8	1.5	3.8
Petroleum Industry	94.3	2.8	2.9
Mining/Minerals Industry	94.0	2.2	3.7
Engineering, Construction, Consulting	95.1	2.4	2.4
Research and Related	95.6	2.9	1.5
Other Employers with Geoscientific Requirements	100.0	0.0	0.0
Employers with No Geoscientific Requirements	92.3	3.8	3.8
Not Employed	94.0	2.7	3.3
Population Total	93.0	3.0	3.9

c. Citizenship and Occupational Category

Table 39 shows citizenship and major occupational categories:

Table 39

Citizenship and Occupational Category (as percentage of occupational categories) (Canada)

	Canada	U.S.	Other
Geologists, Geochemists, and other Earth Scientists	93.0	3.2	3.9
Geophysicists	93.0	3.4	3.7
Petroleum Engineers	97.5	0.0	2.5
Mining Engineers	90.9	0.0	9.1
Engineering Geologists	90.9	4.5	4.5
Hydrologists/Hydrogeologists	87.5	0.0	12.5

14. Professional Society Membership (Question X)

Table 40 shows the total survey response to the question about membership in professional societies. Since respondents were asked to mark all of the societies to which they belonged, the 2,702 respondents indicated a total of 6,400 memberships.

Table 40

Professional Society Membership (Canada)

	Number of Responses	% of Responses
American Association for the Advancement of Science	39	0.6
American Association of Petroleum Geologists	442	6.9
American Chemical Society	6	0.1
American Geophysical Union	116	1.8
American Institute of Physics	4	0.1
American Institute of Professional Geologists	12	0.2
Association for Women Geoscientists	4	0.1
Association of Engineering Geologists	28	0.4
Association of Exploration Geochemists	113	1.8
Canadian Association of Geographers	52	0.8
Canadian Exploration Geophysical Society	64	1.0
Canadian Geophysical Union	115	1.8
Canadian Geotechnical Society	71	1.1
Canadian Institute of Mining and Metallurgy	885	13.8
Canadian Quaternary Association	86	1.3
Canadian Society of Exploration Geophysicists	323	5.0
Canadian Society of Petroleum Geologists	869	13.5
Canadian Well Logging Society	191	3.0
Geological Association of Canada	1,045	16.3
Geological Society of America	171	2.7

North American Survey of Geoscientists

	Number of Responses	% of Responses
Mineralogical Association of Canada	245	3.8
Mineralogical Society of America	69	1.1
National Association of Geology Teachers	12	0.2
Royal Society of Canada	48	0.8
Seismological Society of America	6	0.1
Society of Economic Geologists	145	2.3
Society of Economic Paleontologists and Mineralogists	126	2.0
Society of Exploration Geophysicists	253	3.9
Society of Independent Professional Earth Scientists	1	0.0
Society of Mining Engineers	55	0.9
Society of Petroleum Engineers of AIME	32	0.5
Society of Professional Well Log Analysts	55	0.9
Other	767	12.0
None	18	0.3
Total	**6,418**	**101.1**

The survey population averaged 2.4 memberships each. Of the respondents, 0.3% belong to no professional society.

B. Canadian Geoscience Student Enrollments and Degrees Granted (1976-1987)

Table 41 shows Canadian geoscience student enrollments and degrees granted for all fields combined and selected subdisciplines, for the period 1976-1987. Response rates for the annual student enrollment surveys have averaged about 80%. For an approximation of actual numbers, all figures should be multiplied by a factor of 1.2.

Table 41

Canadian Geoscience Student Enrollments and Degrees Granted 1976 - 1987

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
All Fields												
Enrollments												
Undergraduate	1,371	2,905	2,933	3,017	3,492	4,028	5,316	5,894	4,450	4,563	3,880	3,035
Graduate	547	984	956	871	992	1,041	1,159	1,269	1,095	1,318	1,291	1,302
Total	**1,918**	**3,889**	**3,889**	**3,888**	**4,484**	**5,069**	**6,475**	**7,163**	**5,545**	**5,881**	**5,171**	**4,337**
Degrees												
BA/BS	615	618	569	687	688	730	829	822	603	1,067	991	933
MA/MS	136	183	172	161	181	192	178	144	148	189	232	232
PhD	63	58	71	76	67	61	58	55	53	51	80	61
Total	**814**	**859**	**812**	**924**	**936**	**983**	**1,065**	**1,021**	**804**	**1,307**	**1,303**	**1,226**
Subdisciplines												
Geology												
Enrollments												
Undergraduate	1,292	2,143	2,191	2,231	2,484	2,947	4,094	4,521	3,159	2,746	2,601	1,997
Graduate	499	759	717	673	691	700	778	823	772	802	807	827
Total	**1,791**	**2,902**	**2,908**	**2,904**	**3,175**	**3,647**	**4,872**	**5,344**	**3,931**	**3,548**	**3,408**	**2,824**
Degrees												
BA/BS	456	468	409	472	443	500	575	585	421	715	626	607
MA/MS	99	138	138	104	136	115	109	116	66	119	158	150
PhD	42	35	53	48	37	39	38	42	18	34	46	31
Total	**597**	**641**	**600**	**624**	**616**	**654**	**722**	**743**	**505**	**868**	**830**	**788**

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Geophysics												
Enrollments												
Undergraduate	77	104	105	121	154	192	278	321	299	422	400	272
Graduate	43	91	75	63	81	103	95	128	107	127	113	128
Total	**120**	**195**	**180**	**184**	**235**	**295**	**373**	**449**	**406**	**549**	**513**	**400**
Degrees												
BA/BS	24	25	43	42	47	53	59	68	39	83	82	80
MA/MS	19	19	16	19	17	18	22	10	16	11	20	26
PhD	14	14	11	6	12	7	8	1	3	4	7	9
Total	**57**	**58**	**70**	**67**	**76**	**78**	**89**	**79**	**58**	**98**	**109**	**115**
Oceanography/Marine Science												
Enrollments												
Undergraduate	2	0	0	0	21	0	0	5	10	16	19	19
Graduate	5	10	23	24	57	124	133	137	95	149	128	149
Total	**7**	**10**	**23**	**24**	**78**	**124**	**133**	**142**	**105**	**165**	**147**	**168**
Degrees												
BA/BS	1	0	2	0	0	0	0	0	2	1	6	6
MA/MS	3	3	2	9	12	24	15	3	3	19	11	17
PhD	0	1	3	11	11	10	7	4	8	6	16	8
Total	**4**	**4**	**7**	**20**	**23**	**34**	**22**	**7**	**13**	**26**	**33**	**31**
Geological Engineering												
Enrollments												
Undergraduate	0	494	469	558	566	596	648	748	598	686	416	561
Graduate	0	34	30	41	60	37	47	58	45	93	68	63
Total	**0**	**528**	**499**	**599**	**626**	**633**	**695**	**806**	**643**	**779**	**484**	**624**

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Degrees												
BA/BS	98	86	107	130	149	126	126	80	82	191	137	153
MA/MS	4	7	3	12	4	10	10	6	16	13	5	22
PhD	0	0	0	0	3	0	1	3	4	1	0	6
Total	**102**	**93**	**110**	**142**	**156**	**136**	**137**	**89**	**102**	**205**	**142**	**181**

Soil Science

Enrollments												
Undergraduate	0	22	26	0	34	29	25	27	34	33	19	20
Graduate	0	16	28	0	25	24	38	34	32	35	32	37
Total	**0**	**38**	**54**	**0**	**59**	**53**	**63**	**61**	**66**	**68**	**51**	**57**
Degrees												
BA/BS	5	5	0	4	9	10	7	8	6	14	10	7
MA/MS	6	2	0	6	2	11	4	6	13	7	6	6
PhD	5	1	0	4	3	0	0	1	0	2	4	3
Total	**16**	**8**	**0**	**14**	**14**	**21**	**11**	**15**	**19**	**23**	**20**	**16**

Environmental Science

Enrollments												
Undergraduate	0	84	73	0	73	72	56	50	64	67	81	55
Graduate	0	13	16	2	13	5	7	10	0	0	9	5
Total	**0**	**97**	**89**	**2**	**86**	**77**	**63**	**60**	**64**	**67**	**90**	**60**
Degrees												
BA/BS	14	19	0	24	14	11	21	24	10	16	17	15
MA/MS	0	3	0	3	4	5	2	0	0	0	0	1
PhD	2	0	0	0	1	4	1	0	0	0	1	0
Total	**16**	**22**	**0**	**27**	**19**	**20**	**24**	**24**	**10**	**16**	**18**	**16**

Earth Science/General

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Enrollments												
Undergraduate	0	30	34	68	117	130	140	105	190	441	212	37
Graduate	0	0	0	0	0	18	0	0	3	0	4	0
Total	**0**	**30**	**34**	**68**	**117**	**148**	**140**	**105**	**193**	**441**	**216**	**37**
Degrees												
BA/BS	3	7	3	1	7	13	17	31	19	29	34	34
MA/MS	0	0	0	0	5	0	0	0	0	0	0	0
PhD	0	0	0	0	0	0	0	0	0	0	1	0
Total	**3**	**7**	**3**	**1**	**12**	**13**	**17**	**31**	**19**	**29**	**35**	**34**

Figure h shows enrollments and degrees granted for all fields combined.

Figure h
Total Canadian Geoscience Student Enrollments and Degrees Granted for All Fields
1976-1987

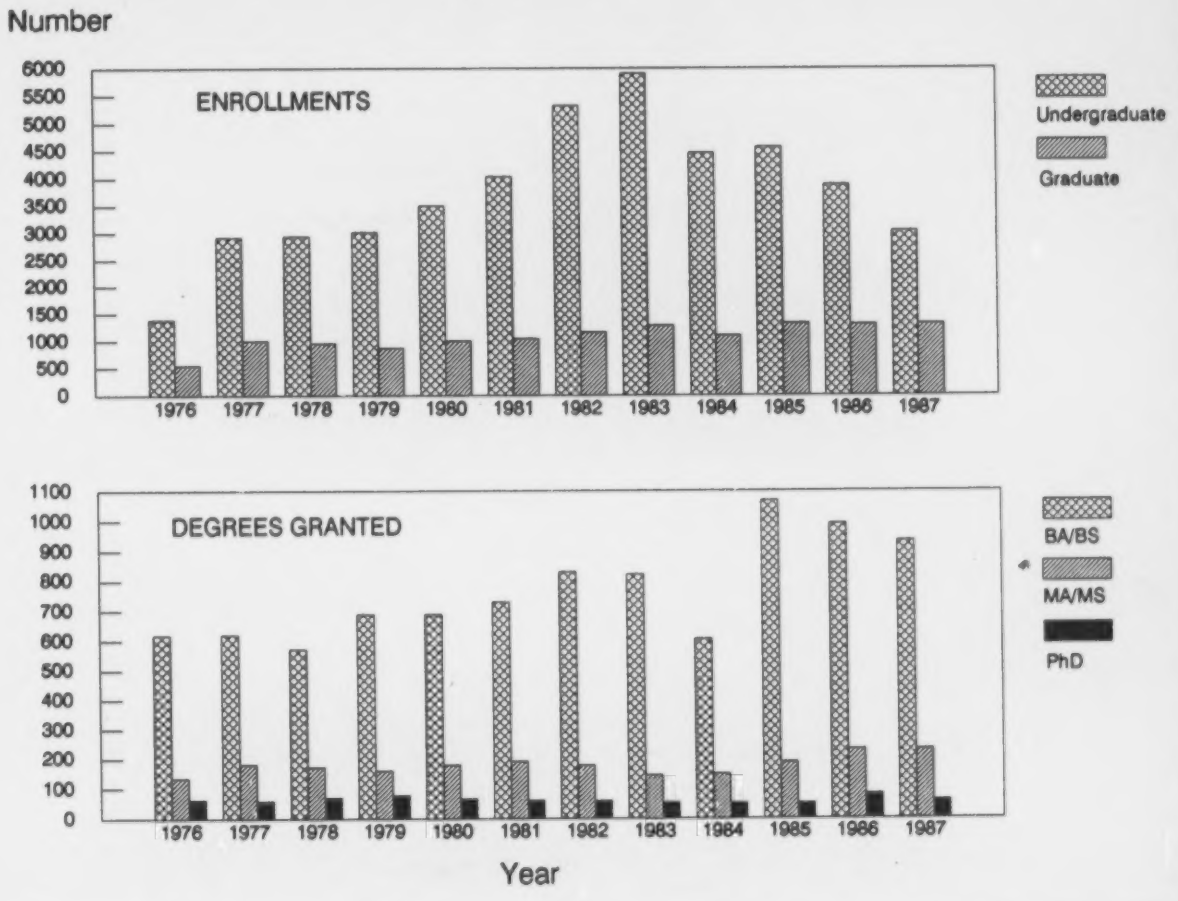


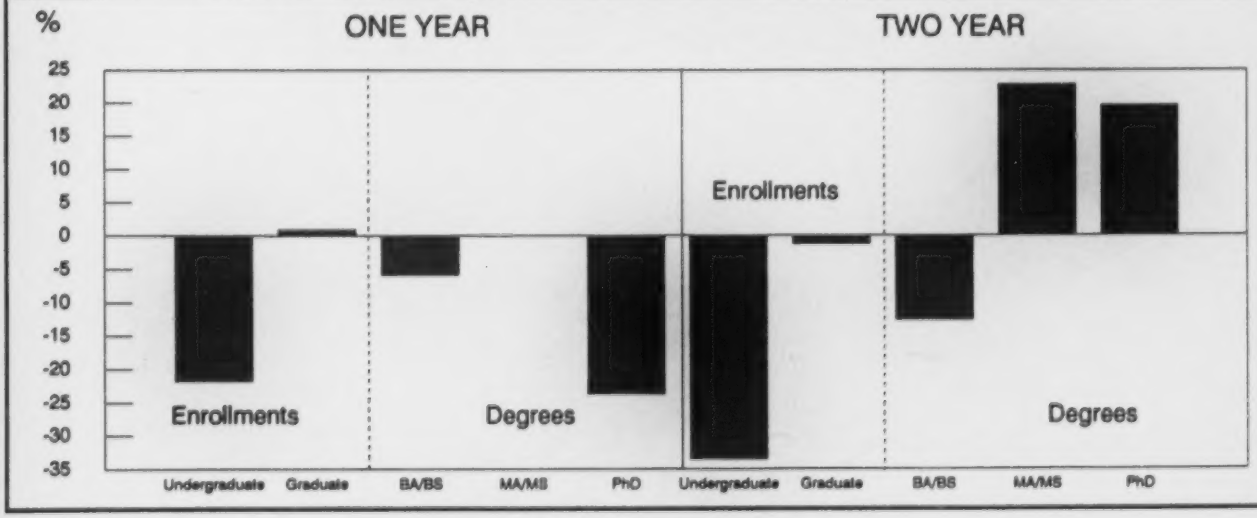
Table 42 and Figure i present the changes in percentages for all fields combined for enrollments and degrees granted for the most recent one- and two-year periods.

Table 42

Percentages of Change for Canadian Geoscience Student Enrollments and Degrees Granted One Year (1986-87) and Two Year (1985-87)

ONE YEAR:	
Undergraduate Enrollments	-21.8
Graduate Enrollments	+ 0.9
Degrees Granted	
BA/BS	- 5.9
MA/MS	0.0
PhD	-23.7
TWO YEAR:	
Undergraduate Enrollments	-33.5
Graduate Enrollments	- 1.2
Degrees Granted	
BA/BS	-12.6
MA/MS	+22.7
PhD	+19.6

Figure i
Percentages of Change for Canadian Geoscience Student Enrollments and Degrees Granted One Year (1986-878) and Two Year (1985-87)



Technical Notes

A. Principal Survey

In May 1986, AGI mailed survey questionnaires to approximately 20% (14,040) of a commercial list of 68,424 geoscientists. A total of 3,026 people returned the questionnaires, for a response rate of 21.6%. Follow-up postcards were sent about two weeks later to provide some measure of the list's accuracy. Approximately 9% were returned as undeliverable. Therefore, the effective sample size was 12,776, and the response rate for that sample size is 23.7%.

B. Graduate Survey

Since the commercial list was presumably derived from membership lists of various professional geoscientific organizations, AGI decided to send the survey to another sample population not derived from such membership lists. Thus, 30 college/university geoscience departments, selected on the basis of faculty profile, size, and geographic location, were asked to provide a list of their alumni. From this sample of 5,000 graduates, 1,727 responses were received, for a response rate of 34.5%. No follow-up postcards were sent, and therefore the undeliverable rate is not known for this part of the survey.

C. Canadian Survey

In May 1987, AGI sent survey forms to a sample of Canadian geoscientists. The survey form was identical to that used for the U.S. survey except for question X, in which additional Canadian geoscientific organizations were substituted for several of the smaller U.S. organizations.

Survey forms were sent to approximately 38% of the total membership of the Canadian Geoscience Council's 12 member societies. Of the 6,019 surveys sent, 2,702 were returned, for a response rate of 44.9%. Roughly 3.7% of the surveys were returned as undeliverable. The effective sample size was thus 5,796, and the response rate for that sample was 46.6%.

D. Sampling Error

The sample of responses from this survey mailing is only one of a large number of possible samples of the same size that could have been received from the same mailing. The deviation of a sample estimate from the average of all possible samples is defined as sampling error. The sampling error (e) is calculated by solving the following equation for e:

$$N = (z/e)^2(p)(1-p)$$

$$\text{thus: } e = \sqrt{\frac{z^2(p)(1-p)}{N}}$$

e = sampling error;
z = value for confidence level;
for 95%, z = 1.96:
for 99%, z = 2.576;
p = probability; by using 0.5 we have the most conservative probability we can use;
N = number in sample.

For the U.S. Section, where N = 3,026, the sampling error is +/- 1.8% at the 95% confidence level and +/- 2.4% at the 99% confidence level.

For the survey of graduates, where N = 1,727, the sampling error is +/- 2.4% at the 95% confidence level and +/- 3.1 at the 99% confidence level.

For the Canadian Section, where N = 2,702, the sampling error is +/- 1.9% at the 95% confidence level and +/- 2.5% at the 99% confidence level.

E. Petroleum and Mining Engineers

Because of their close interaction with other geoscientists and because commercial mailing lists commonly include them with other geoscientists, petroleum engineers and mining engineers were included in the survey sample.

To determine whether their inclusion made a significant difference in the results, all the major categories discussed in this report were run with and without the petroleum and mining engineering populations.

The following tables present those results for five of the survey's major questions: primary specialty, annual income, occupational level, years of experience, and number of companies/institutions worked for. There appear to be no significant differences resulting from the inclusion of petroleum and mining engineers.

Primary Specialty

Primary Specialty	Response % for Full Survey	Response % Without Petroleum & Mining Engineers
Atmospheric Science	0.6	0.7
Economic and Mining Geology	5.4	7.9
Engineering Geology and Engineering Geophysics	9.1	14.3
Environmental Geology	1.1	1.6
General Geology and Earth Science	2.3	2.9
Geochemistry	1.2	1.6
Geomorphology	0.4	0.6
Geophysics	14.2	21.8
Hydrology and Hydrogeology	2.1	3.6
Marine Geology and Marine Geophysics	1.6	2.5
Mathematical Geology and Geostatistics	0.3	0.4
Mineralogy	0.5	0.6
Mining Engineering	4.6	0.2
Oceanography	0.7	0.8
Paleontology and Palynology	0.3	0.4
Petroleum Engineering	29.9	1.3
Petroleum Geology	10.3	14.8
Petroleum Geophysics	13.0	19.6
Petrology	0.7	1.0
Planetology	0.1	0.1
Remote Sensing	0.5	0.8
Sedimentology	0.5	0.8
Soil Science	0.1	0.1
Stratigraphy	0.4	0.6
Structural Geology and Tectonics	0.5	0.7
Volcanology	0.2	0.3

Annual Income

Annual Income	Response % for Full Survey	Response % Without Petroleum & Mining Engineers
Less than $20,000	9.3	5.9
$20,000 - $29,999	4.9	6.2
$30,000 - $39,999	14.9	16.8
$40,000 - $49,999	19.4	21.1
$50,000 - $59,999	16.9	17.2
$60,000 - $69,999	11.4	10.9
$70,000 - $79,999	7.0	6.3
$80,000 - $99,999	8.4	8.1
$100,000 - $124,999	4.0	3.9
$125,000 - $149,999	1.1	1.2
$150,000 and over	2.6	2.4

Occupational Level

Occupational Level	Response % for Full Survey	Response % Without Petroleum & Mining Engineers
Senior Manager/Director/Dean/Educational Department Head	22.7	20.9
Senior Professional/Professor/Associate Professor/ Middle Manager	45.7	50.0
Professional/Assistant Professor/Assistant Superintendent	26.3	25.8
Junior Professional/Instructor/Foreman	4.0	2.5
Technician/Paraprofessional	1.3	0.8

Years of Geoscientific Professional Experience		
Years of Experience	Response % for Full Survey	Response % Without Petroleum & Mining Engineers
Less than 5	9.8	6.8
5 - 9	21.0	20.8
10 - 14	15.3	17.6
15 - 19	9.8	10.7
20 - 24	8.4	9.7
25 - 29	9.4	10.1
More than 29	26.4	24.3

Number of Companies/Institutions Worked For		
Number of Companies/ Institutions Worked For	Response % for Full Survey	Response % Without Petroleum & Mining Engineers
0	0.7	0.6
1	29.4	26.9
2	24.5	25.6
3	20.4	22.8
4	11.2	11.5
5	6.9	6.7
More than 5	6.8	5.9

F. Statistical Principles Applied

All percentages presented in this report have been rounded to significant figures according to standard rounding rules:

- a number is rounded "down" if the first insignificant figure is less than 5;
- a number is rounded "up" if the first insignificant figure is more than 5;
- if the first insignificant number is 5, an even number preceding is rounded "down," and an odd number is rounded "up." For example, the numbers 2.65 and 2.55 both round to 2.6.

G. Data Base/Software Capabilities

The Statistical Package for the Social Sciences (SPSS PC+) is the program used to store and process the survey raw data. All cross-tabulations (with attendant statistical tests applied) in this report were produced by the SPSS program.

The data sets of the three surveys are maintained separately. In a few instances, the data were experimentally combined to test the total population figures against each survey.

I. INDICATE THE SPECIALTY CLOSEST TO THE FIELD IN WHICH YOU EARNED EACH OF YOUR DEGREES. MARK ONE OVAL FOR EACH OF THE DEGREES YOU EARNED:

GEOSCIENTIFIC SPECIALTY	ASSOCIATE	BACHELORS	MASTERS	DOCTORATE
1. Atmospheric Science	3	18	14	5
2. Economic and Mining Geology	2	74	68	29
3. Engineering Geology & Engineering Geophysics	9	132	70	16
4. Environmental Geology	2	10	11	1
5. General Geology and Earth Science	33	814	133	20
6. Geochemistry	4	15	19	19
7. Geomorphology	3	6	13	8
8. Geophysics	13	190	205	103
9. Hydrology and Hydrogeology	1	6	16	6
10. Marine Geology and Marine Geophysics	0	6	12	13
11. Mathematical Geology and Geostatistics	0	3	5	5
12. Mineralogy	4	15	14	8
13. Mining Engineering	6	138	40	9
14. Oceanography	4	6	11	12
15. Paleontology and Palynology	0	6	13	9
16. Petroleum Engineering	39	511	109	28
17. Petroleum Geology	15	153	53	4
18. Petroleum Geophysics	1	34	20	6
19. Petrology	0	6	28	27
20. Planetology	0	1	3	2
21. Remote Sensing	0	3	1	0
22. Sedimentology	2	12	32	14
23. Soil Science	3	1	0	0
24. Stratigraphy	1	9	31	11
25. Structural Geology and Tectonics	1	9	26	20
26. Volcanology	0	0	4	4
	N=146	2,178	951	379

NONGEOSCIENTIFIC SPECIALTY				
1. Chemistry	18	104	20	17
2. Civil Engineering	10	75	29	9
3. Computer Science	10	11	9	2
4. Electrical Engineering	13	60	21	9
5. Liberal Arts	24	65	3	2
6. Mathematics	26	142	27	9
7. Mechanical Engineering	19	132	11	7
8. Physics	22	173	54	35
9. Other Engineering/Scientific	31	117	38	21
10. Other (indicate below)	30	85	116	20
	N=203	964	328	131

II. INDICATE YOUR GEOSCIENTIFIC SPECIALTY OR SPECIALTIES (see note below*):

	PRIMARY SPECIALTY (Mark one only)	SECONDARY SPECIALTIES (Mark up to three)
1. Atmospheric Science	17	28
2. Economic and Mining Geology	148	198
3. Engineering Geology & Engineering Geophysics	250	275
4. Environmental Geology	29	179
5. General Geology and Earth Science	62	357
6. Geochemistry	32	106
7. Geomorphology	10	61
8. Geophysics	390	256
9. Hydrology and Hydrogeology	57	191
10. Marine Geology and Marine Geophysics	44	129
11. Mathematical Geology and Geostatistics	8	81
12. Mineralogy	14	50
13. Mining Engineering	126	120
14. Oceanography	19	49
15. Paleontology and Palynology	8	20
16. Petroleum Engineering	822	189
17. Petroleum Geology	283	539
18. Petroleum Geophysics	357	264
19. Petrology	20	80
20. Planetology	1	20
21. Remote Sensing	13	69
22. Sedimentology	15	93
23. Soil Science	1	68
24. Stratigraphy	10	191
25. Structural Geology and Tectonics	13	269
26. Volcanology	4	40
	N=2,753	3,922

*NOTE: For purposes of this survey, an individual has a professional specialty in a geoscientific discipline in which the individual:

- Has a degree or college major in that geoscientific specialty.
- Has practiced for three or more years in a position that would normally be filled by someone with a degree or college major in the geoscientific specialty.

III. WHICH SPECIALTY ARE YOU NOW PRACTICING?**

(Mark one only)

1.	12
2.	126
3.	230
4.	36
5.	34
6.	24
7.	11
8.	295
9.	69
10.	41
11.	10
12.	7
13.	93
14.	12
15.	10
16.	720
17.	268
18.	345
19.	18
20.	1
21.	16
22.	11
23.	1
24.	9
25.	9
26.	4
NONE	390
	N=2,802

**Please refer to question numbers as listed in Question II.

IV. INDICATE YOUR CURRENT EMPLOYER CATEGORY (Mark only one):

1. ACADEMIC
- Secondary School 110
- Junior College/Technical 130
- College/University 1930

N=217

2. GOVERNMENT
- Federal/National 2560
- State/Local/Provincial 900
- Military 110
- Other than U.S. or Canada 10

N=358

3. PETROLEUM INDUSTRY
- Integrated Petroleum Company 6330
- Independent Exploration and Production Company 3400
- Drilling Contractor 140
- Oil Field Service 1870
- Consultant 2940
- Other 770

N=1,545

4. MINING OR MINERALS INDUSTRY
- Exploration and/or Producing Company 1350
- Consultant 500
- Other 80

N=193

5. ENGINEERING, CONSTRUCTION, CONSULTING
- Construction and/or Engineering Firm 1270
- Geoscientific Studies Consultant 1060
- Other 220

N=255

6. RESEARCH AND RELATED
- Research Institute or Laboratory 550
- Library 200
- Museum 40
- Other 70

N=86

7. OTHER EMPLOYERS WITH GEOSCIENTIFIC REQUIREMENTS
- Banking/Financial 310
- Equipment Manufacturers 190
- Law 40
- Journalism/Media 20
- Other 150

N=71

8. EMPLOYER WITH NO REQUIREMENTS FOR GEOSCIENTIFIC EXPERTISE
- By your choice 210
- By necessity, but want to return to geoscientific position 250
- By necessity, but do not want to return to geoscientific position 100

N=56

9. NOT EMPLOYED
- Retired 1860
- Unemployed but want to return to geoscientific position 1010
- Unemployed but do not want to return to geoscientific position 110
- Student 100
- Other 70

N=315 N=3,096

V. INDICATE YOUR OCCUPATIONAL LEVEL:

- Senior Manager/Director/Dean/Educational Department Head/etc. 6050
- Senior Professional/Professor/Associate Professor/Middle Manager/etc. 1,2210
- Professional/Assistant Professor/Assistant Superintendent/etc. 7020
- Junior Professional/Instructor/Foreman/etc. 1060
- Technician/Paraprofessional/etc. 350

N=2,669

VI. INDICATE THE PRIMARY OBJECTIVE OF YOUR OCCUPATION (Mark the one oval most pertinent):

1. FINDING AND DEVELOPING OIL AND GAS
- Research 1420
- Seismic data acquisition and processing 1940
- Exploration evaluation 6010
- Field development 4860
- Other 2100

N=1,633

2. FINDING AND DEVELOPING OTHER RESOURCES
- Metals 1420
- Coal 420
- Industrial minerals, including agricultural 470
- Water 250
- Other 250

N=281

3. GEOTECHNICAL APPLICATIONS
- Environmental and health investigation 730
- Construction and civil development 1940
- Hazard assessment 650
- Other 260

N=358

4. PUBLIC POLICY ADMINISTRATION 590

5. GEOSCIENTIFIC EDUCATION, BASIC RESEARCH AND COMMUNICATIONS
- Teaching 880
- Basic research 1500
- Library 10
- Museum 40
- Journalism/Editing 10
- Other 120

N=256

6. OTHER GEOSCIENTIFIC APPLICATION 840

7. NON-GEOSCIENTIFIC RELATED (i.e., an occupational objective that makes no material use of your geoscientific specialties) 1200

8. NOT CURRENTLY EMPLOYED 2120

N=3,003

VII. YEARS OF GEOSCIENTIFIC PROFESSIONAL EXPERIENCE:

Less than 5	282	0
5-9	607	0
10-14	441	0
15-19	280	0
20-24	241	0
25-29	270	0
More than 29	763	0

N=2,884

VIII. NUMBER OF COMPANIES/ INSTITUTIONS WORKED FOR (FULL TIME ONLY):

0	20	0
1	852	0
2	710	0
3	592	0
4	325	0
5	199	0
More than 5	191	0

N=2,889

IX. TOTAL CURRENT ANNUAL EMPLOYMENT INCOME (IN U.S. $) FROM GEOSCIENTIFIC EMPLOYMENT (INCLUDE SALARY, BONUSES, AND CONSULTING FEES):

Less than $20,000	254	0
$20,000-$29,999	134	0
$30,000-$39,999	407	0
$40,000-$49,999	531	0
$50,000-$59,999	460	0
$60,000-$69,999	313	0
$70,000-$79,999	193	0
$80,000-$89,999	230	0
$100,000-$124,999	111	0
$125,000-$149,999	31	0
$150,000 and over	72	0

N=2,736

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X. INDICATE YOUR MEMBERSHIP IN THE FOLLOWING GEOSCIENTIFIC ORGANIZATIONS (Mark as many ovals as are appropriate):

American Association for the the Advancement of Science	1850
American Association of Petroleum Geologists	6450
American Association of Stratigraphic Palynologists	10
American Chemical Society	330
American Geophysical Union	2600
American Institute of Physics	270
American Institute of Professional Geologists	1840
American Society for Photogrammetry and Remote Sensing	250
Association for Women Geoscientists	180
Association for American State Geologists	30
Association for Earth Science Editors	70
Association for Engineering Geologists	3160
Canadian Society of Exploration Geophysicists	170
Canadian Geophysical Union	00
Geochemical Society	230
Geological Association of Canada	120
Geological Society of America	3680
Geoscience Information Society	30
Mineralogical Society of America	370
Mineralogical Society of Canada	120
National Association of Geology Teachers	190
Paleontological Society	100
Seismological Society of America	640
Society of Economic Geologists	910
Society of Economic Paleontologists and Mineralogists	1070
Society of Exploration Geophysicists	8820
Society of Independent Professional Earth Scientists	300
Society of Mining Engineers of AIME	3620
Society of Petroleum Engineers of AIME	1,0960
Society of Professional Well Log Analysts	1520
Society of Vertebrate Paleontology	30
Other (indicate below)	4230
None	940

N=5,509

XI. PRIMARY WORK LOCATION:

United States:		
Pacific Coast/Hawaii	360	0
Rocky Mountains	339	0
Southwest	381	0
Gulf Coast	819	0
Mid-Continent	372	0
East Coast	273	0
Alaska	29	0
Canada:		
British Columbia	1	0
Yukon & Northwest Territories	0	0
Prairies	5	0
Ontario and Quebec	1	0
Atlantic Provinces	1	0
Central America/Caribbean	3	0
South America	11	0
Europe	9	0
Middle East	9	0
Africa	9	0
Asia	10	0
Australia/Oceania	3	0
Other	23	0

N=2,658

XII. RACE/ETHNIC ORIGIN

American Indian/Alaskan Native	28	0
Arab	11	0
Black	11	0
Caucasian	2,682	0
Hispanic	27	0
Asian/Pacific Islander	50	0

N=2,809

XIII. U.S. ZIP CODE OR CANADIAN POSTAL CODE OF OFFICE LOCATION (Blacken appropriate ovals in columns below):

U.S. ZIP CODE

CANADIAN POSTAL CODE

XIV. AGE:

Under 25	17	0
25-29	324	0
30-34	494	0
35-39	413	0
40-44	256	0
45-49	248	0
50-54	305	0
55-59	334	0
60-64	241	0
65-69	127	0
70 or over	142	0

N=2,901

XV. SEX:

Male	2,733	0
Female	150	0

N=2,883

XVI. CITIZENSHIP:

United States	2,808	0
Canadian	29	0
Other	50	0

N=2,887

I. INDICATE THE SPECIALTY CLOSEST TO THE FIELD IN WHICH YOU EARNED EACH OF YOUR DEGREES. MARK ONE OVAL FOR EACH OF THE DEGREES YOU EARNED:

GEOSCIENTIFIC SPECIALTY	ASSOCIATE	BACHELORS	MASTERS	DOCTORATE
1. Atmospheric Science	00	280	140	70
2. Economic and Mining Geology	30	730	970	340
3. Engineering Geology & Engineering Geophysics	00	1000	320	30
4. Environmental Geology	10	170	90	10
5. General Geology and Earth Science	200	8750	1120	130
6. Geochemistry	10	170	340	240
7. Geomorphology	10	110	370	270
8. Geophysics	00	630	550	310
9. Hydrology and Hydrogeology	10	90	260	30
10. Marine Geology and Marine Geophysics	00	20	160	70
11. Mathematical Geology and Geostatistics	10	10	20	10
12. Mineralogy	20	150	400	190
13. Mining Engineering	60	870	230	60
14. Oceanography	20	210	140	130
15. Paleontology and Palynology	00	230	780	670
16. Petroleum Engineering	20	540	260	30
17. Petroleum Geology	50	710	640	30
18. Petroleum Geophysics	00	60	90	00
19. Petrology	10	60	450	290
20. Planetology	10	30	30	00
21. Remote Sensing	00	20	50	20
22. Sedimentology	00	180	550	250
23. Soil Science	10	10	40	30
24. Stratigraphy	00	90	610	240
25. Structural Geology and Tectonics	20	150	470	370
26. Volcanology	00	20	50	70
	N=50	1,529	913	389

NONGEOSCIENTIFIC SPECIALTY				
1. Chemistry	80	540	200	60
2. Civil Engineering	90	110	90	60
3. Computer Science	60	50	50	20
4. Electrical Engineering	40	50	10	10
5. Liberal Arts	190	920	90	30
6. Mathematics	120	310	50	10
7. Mechanical Engineering	30	100	20	10
8. Physics	40	300	80	40
9. Other Engineering/Scientific	100	260	200	50
10. Other (indicate below)	240	630	1010	450
	N=99	327	180	74

II. INDICATE YOUR GEOSCIENTIFIC SPECIALTY OR SPECIALTIES (see note below*):

	PRIMARY SPECIALTY (Mark one only)	SECONDARY SPECIALTIES (Mark up to three)
1. Atmospheric Science	360	230
2. Economic and Mining Geology	1570	1350
3. Engineering Geology & Engineering Geophysics	750	1080
4. Environmental Geology	320	1410
5. General Geology and Earth Science	2000	2150
6. Geochemistry	370	1290
7. Geomorphology	300	530
8. Geophysics	910	920
9. Hydrology and Hydrogeology	570	1090
10. Marine Geology and Marine Geophysics	140	420
11. Mathematical Geology and Geostatistics	50	400
12. Mineralogy	390	850
13. Mining Engineering	990	530
14. Oceanography	310	490
15. Paleontology and Palynology	820	500
16. Petroleum Engineering	800	520
17. Petroleum Geology	2650	1530
18. Petroleum Geophysics	570	820
19. Petrology	280	880
20. Planetology	40	160
21. Remote Sensing	200	580
22. Sedimentology	460	1320
23. Soil Science	90	470
24. Stratigraphy	270	2450
25. Structural Geology and Tectonics	380	1640
26. Volcanology	110	350
	N=1,570	2,396

*NOTE: For purposes of this survey, an individual has a professional specialty in a geoscientific discipline in which the individual:

- Has a degree or college major in that geoscientific specialty.
- Has practiced for three or more years in a position that would normally be filled by someone with a degree or college major in the geoscientific specialty.

III. WHICH SPECIALTY ARE YOU NOW PRACTICING?**

(Mark one only)

1.	0 23
2.	0 97
3.	0 49
4.	0 31
5.	0 62
6.	0 33
7.	0 18
8.	0 46
9.	0 64
10.	0 14
11.	0 10
12.	0 25
13.	0 55
14.	0 18
15.	0 57
16.	0 61
17.	0 204
18.	0 43
19.	0 18
20.	0 5
21.	0 20
22.	0 25
23.	0 8
24.	0 13
25.	0 28
26.	0 11
NONE	0 601
	N=1,639

**Please refer to question numbers as listed in Question II.

IV. INDICATE YOUR CURRENT EMPLOYER CATEGORY (Mark only one):

1. ACADEMIC
- Secondary School 330
- Junior College/Technical 150
- College/University 2430

N=291

2. GOVERNMENT
- Federal/National 1560
- State/Local/Provincial 730
- Military 170
- Other than U.S. or Canada 10

N=247

3. PETROLEUM INDUSTRY
- Integrated Petroleum Company 1640
- Independent Exploration and Production Company 740
- Drilling Contractor 20
- Oil Field Service 230
- Consultant 760
- Other 140

N=353

4. MINING OR MINERALS INDUSTRY
- Exploration and/or Producing Company 870
- Consultant 310
- Other 90

N=127

5. ENGINEERING, CONSTRUCTION, CONSULTING
- Construction and/or Engineering Firm 640
- Geoscientific Studies Consultant 490
- Other 150

N=128

6. RESEARCH AND RELATED
- Research Institute or Laboratory 400
- Library 120
- Museum 160
- Other 50

N=73

7. OTHER EMPLOYERS WITH GEOSCIENTIFIC REQUIREMENTS
- Banking/Financial 70
- Equipment Manufacturers 20
- Law 60
- Journalism/Media 60
- Other 130

N=34

8. EMPLOYER WITH NO REQUIREMENTS FOR GEOSCIENTIFIC EXPERTISE
- By your choice 1200
- By necessity, but want to return to geoscientific position 610
- By necessity, but do not want to return to geoscientific position 410

N=222

9. NOT EMPLOYED
- Retired 1520
- Unemployed but want to return to geoscientific position 720
- Unemployed but do not want to return to geoscientific position 130
- Student 440
- Other 220

N=303 N=1,778

V. INDICATE YOUR OCCUPATIONAL LEVEL:

- Senior Manager/Director/Dean/Educational Department Head/etc. 2690
- Senior Professional/Professor/Associate Professor/Middle Manager/etc. 5680
- Professional/Assistant Professor/Assistant Superintendent/etc. 3950
- Junior Professional/Instructor/Foreman/etc. 1660
- Technician/Paraprofessional/etc. 930

N=1,491

VI. INDICATE THE PRIMARY OBJECTIVE OF YOUR OCCUPATION (Mark the one oval most pertinent):

1. FINDING AND DEVELOPING OIL AND GAS
- Research 350
- Seismic data acquisition and processing 150
- Exploration evaluation 2260
- Field development 840
- Other 360

N=396

2. FINDING AND DEVELOPING OTHER RESOURCES
- Metals 810
- Coal 420
- Industrial minerals, including agricultural 370
- Water 280
- Other 150

N=203

3. GEOTECHNICAL APPLICATIONS
- Environmental and health investigation 680
- Construction and civil development 500
- Hazard assessment 180
- Other 130

N=149

4. PUBLIC POLICY ADMINISTRATION 400

5. GEOSCIENTIFIC EDUCATION, BASIC RESEARCH AND COMMUNICATIONS
- Teaching 1760
- Basic research 1520
- Library 30
- Museum 170
- Journalism/Editing 160
- Other 100

N=374

6. OTHER GEOSCIENTIFIC APPLICATION 510

7. NON-GEOSCIENTIFIC RELATED (i.e., an occupational objective that makes no material use of your geoscientific specialties) 3160

8. NOT CURRENTLY EMPLOYED 1980

N=1,727

VII. YEARS OF GEOSCIENTIFIC PROFESSIONAL EXPERIENCE:

Less than 5	555	0
5-9	304	0
10-14	177	0
15-19	121	0
20-24	105	0
25-29	120	0
More than 29	303	0

N=1,685

VIII. NUMBER OF COMPANIES/ INSTITUTIONS WORKED FOR (FULL TIME ONLY):

0	97	0
1	561	0
2	449	0
3	246	0
4	171	0
5	78	0
More than 5	83	0

N=1,685

IX. TOTAL CURRENT ANNUAL EMPLOYMENT INCOME (IN U.S. $) FROM GEOSCIENTIFIC EMPLOYMENT (INCLUDE SALARY, BONUSES, AND CONSULTING FEES):

Less than $20,000	476	0
$20,000-$29,999	178	0
$30,000-$39,999	243	0
$40,000-$49,999	206	0
$50,000-$59,999	135	0
$60,000-$69,999	109	0
$70,000-$79,999	48	0
$80,000-$99,999	58	0
$100,000-$124,999	34	0
$125,000-$149,999	11	0
$150,000 and over	27	0

N=1,525

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X. INDICATE YOUR MEMBERSHIP IN THE FOLLOWING GEOSCIENTIFIC ORGANIZATIONS (Mark as many ovals as are appropriate):

American Association for the the Advancement of Science	1410
American Association of Petroleum Geologists	4020
American Association of Stratigraphic Palynologists	80
American Chemical Society	200
American Geophysical Union	1610
American Institute of Physics	60
American Institute of Professional Geologists	950
American Society for Photogrammetry and Remote Sensing	240
Association for Women Geoscientists	280
Association for American State Geologists	40
Association for Earth Science Editors	90
Association for Engineering Geologists	410
Canadian Society of Exploration Geophysicists	10
Canadian Geophysical Union	30
Geochemical Society	350
Geological Association of Canada	160
Geological Society of America	3340
Geoscience Information Society	30
Mineralogical Society of America	610
Mineralogical Society of Canada	230
National Association of Geology Teachers	540
Paleontological Society	560
Seismological Society of America	140
Society of Economic Geologists	730
Society of Economic Paleontologists and Mineralogists	1430
Society of Exploration Geophysicists	1070
Society of Independent Professional Earth Scientists	60
Society of Mining Engineers of AIME	1890
Society of Petroleum Engineers of AIME	1060
Society of Professional Well Log Analysts	240
Society of Vertebrate Paleontology	270
Other (indicate below)	3010

N=2,515

None 4870

N=3,002

XI. PRIMARY WORK LOCATION:

United States:		
Pacific Coast/Hawaii	2310	
Rocky Mountains	2790	
Southwest	1240	
Gulf Coast	1840	
Mid-Continent	3260	
East Coast	3190	
Alaska	320	
	N=1,495	
Canada:		
British Columbia	20	
Yukon & Northwest Territories	10	
Prairies	60	
Ontario and Quebec	30	
Atlantic Provinces	20	
	N=14	
Central America/Caribbean	50	
South America	70	
Europe	30	
Middle East	10	
Africa	30	
Asia	40	
Australia/Oceania	10	
Other	130	

N=1,546

XII. RACE/ETHNIC ORIGIN

American Indian/Alaskan Native	120	
Arab	20	
Black	00	
Caucasian	1,6060	
Hispanic	60	
Asian/Pacific Islander	180	

N=1,644

XIII. U.S. ZIP CODE OR CANADIAN POSTAL CODE OF OFFICE LOCATION (Blacken appropriate ovals in columns below):

U.S. ZIP CODE

CANADIAN POSTAL CODE

XIV. AGE:

Under 25	71	0
25-29	235	0
30-34	300	0
35-39	242	0
40-44	121	0
45-49	127	0
50-54	167	0
55-59	147	0
60-64	135	0
65-69	76	0
70 or over	64	0

N=1,685

XV. SEX:

Male	1,441	0
Female	246	0

N=1,687

XVI. CITIZENSHIP:

United States	1,651	0
Canadian	21	0
Other	11	0

N=1.683

I. INDICATE THE SPECIALTY CLOSEST TO THE FIELD IN WHICH YOU EARNED EACH OF YOUR DEGREES. MARK ONE OVAL FOR EACH OF THE DEGREES YOU EARNED:

GEOSCIENTIFIC SPECIALTY	ASSOCIATE	BACHELORS	MASTERS	DOCTORATE
1. Atmospheric Science	0	6	9	6
2. Economic and Mining Geology	21	303	220	84
3. Engineering Geology & Engineering Geophysics	4	186	33	8
4. Environmental Geology	2	12	6	2
5. General Geology and Earth Science	21	1,176	99	44
6. Geochemistry	5	27	73	83
7. Geomorphology	3	63	56	40
8. Geophysics	15	130	87	66
9. Hydrology and Hydrogeology	2	4	18	4
10. Marine Geology and Marine Geophysics	2	3	10	10
11. Mathematical Geology and Geostatistics	2	2	7	6
12. Mineralogy	9	20	43	29
13. Mining Engineering	8	36	7	3
14. Oceanography	1	3	5	6
15. Paleontology and Palynology	3	16	55	56
16. Petroleum Engineering	4	11	3	4
17. Petroleum Geology	23	139	31	5
18. Petroleum Geophysics	11	11	12	4
19. Petrology	0	33	101	83
20. Planetology	0	1	4	4
21. Remote Sensing	2	1	6	5
22. Sedimentology	1	21	69	54
23. Soil Science	1	5	9	5
24. Stratigraphy	2	23	51	35
25. Structural Geology and Tectonics	3	16	55	55
26. Volcanology	0	4	9	9
	145	2,252	1,078	710

NONGEOSCIENTIFIC SPECIALTY				
1. Chemistry	16	105	22	21
2. Civil Engineering	14	31	15	13
3. Computer Science	13	6	4	4
4. Electrical Engineering	5	23	4	1
5. Liberal Arts	15	52	3	4
6. Mathematics	7	52	6	1
7. Mechanical Engineering	3	15	3	1
8. Physics	8	118	31	16
9. Other Engineering/Scientific	8	48	17	12
10. Other (indicate below) _____	34	72	36	13
	123	522	141	86
	268	2,774	1,219	796

II. INDICATE YOUR GEOSCIENTIFIC SPECIALTY OR SPECIALTIES (see note below*):

	PRIMARY SPECIALTY (Mark one only)	SECONDARY SPECIALTIES (Mark up to three)	
1. Atmospheric Science	12	8	
2. Economic and Mining Geology	625	277	
3. Engineering Geology & Engineering Geophysics	83	174	
4. Environmental Geology	9	102	
5. General Geology and Earth Science	193	435	
6. Geochemistry	84	400	
7. Geomorphology	68	92	
8. Geophysics	193	242	
9. Hydrology and Hydrogeology	28	82	
10. Marine Geology and Marine Geophysics	21	74	
11. Mathematical Geology and Geostatistics	13	84	
12. Mineralogy	61	140	
13. Mining Engineering	12	103	
14. Oceanography	2	22	
15. Paleontology and Palynology	60	49	
16. Petroleum Engineering	41	62	
17. Petroleum Geology	566	261	
18. Petroleum Geophysics	170	149	
19. Petrology	56	205	
20. Planetology	0	8	
21. Remote Sensing	16	71	
22. Sedimentology	59	293	
23. Soil Science	5	51	
24. Stratigraphy	33	417	
25. Structural Geology and Tectonics	45	245	
26. Volcanology	3	110	
	2,458	4,156	6,614

*NOTE: For purposes of this survey, an individual has a professional specialty in a geoscientific discipline in which the individual:

- Has a degree or college major in that geoscientific specialty.
- Has practiced for three or more years in a position that would normally be filled by someone with a degree or college major in the geoscientific specialty.

III. WHICH SPECIALTY ARE YOU NOW PRACTICING?**

(Mark one only)

1.	9
2.	587
3.	74
4.	9
5.	111
6.	83
7.	48
8.	162
9.	26
10.	20
11.	21
12.	57
13.	12
14.	1
15.	49
16.	40
17.	563
18.	178
19.	44
20.	0
21.	18
22.	43
23.	7
24.	30
25.	38
26.	3
NONE	227
	N=2,460

**Please refer to question numbers as listed in Question II.

IV. INDICATE YOUR CURRENT EMPLOYER CATEGORY (Mark only one):

1. ACADEMIC

Secondary School	7	0
Junior College/Technical	12	0
College/University	289	0
	308	

2. GOVERNMENT

Federal/National	208	0
State/Local/Provincial	168	0
Military	0	0
Other than U.S. or Canada	4	0
	380	

3. PETROLEUM INDUSTRY

Integrated Petroleum Company	347	0
Independent Exploration and Production Company	329	0
Drilling Contractor	0	0
Oil Field Service	52	0
Consultant	132	0
Other	36	0
	896	

4. MINING OR MINERALS INDUSTRY

Exploration and/or Producing Company	365	0
Consultant	227	0
Other	11	0
	603	

5. ENGINEERING, CONSTRUCTION, CONSULTING

Construction and/or Engineering Firm	40	0
Geoscientific Studies Consultant	54	0
Other	7	0
	101	

6. RESEARCH AND RELATED

Research Institute or Laboratory	39	0
Library	4	0
Museum	17	0
Other	12	0
	72	

7. OTHER EMPLOYERS WITH GEOSCIENTIFIC REQUIREMENTS

Banking/Financial	6	0
Equipment Manufacturers	3	0
Law	0	0
Journalism/Media	4	0
Other	4	0
	17	

8. EMPLOYER WITH NO REQUIREMENTS FOR GEOSCIENTIFIC EXPERTISE

By your choice	9	0
By necessity, but want to return to geoscientific position	15	0
By necessity, but do not want to return to geoscientific position	8	0
	32	

9. NOT EMPLOYED

Retired	85	0
Unemployed but want to return to geoscientific position	51	0
Unemployed but do not want to return to geoscientific position	10	0
Student	42	0
Other	5	0
	193	N=2,602

V. INDICATE YOUR OCCUPATIONAL LEVEL:

Senior Manager/Director/Dean/Educational Department Head/etc.	432	0
Senior Professional/Professor/Associate Professor/Middle Manager/etc.	1,076	0
Professional/Assistant Professor/Assistant Superintendent/etc.	667	0
Junior Professional/Instructor/Foreman/etc.	168	0
Technician/Paraprofessional/etc.	62	0
	N= 2,405	

VI. INDICATE THE PRIMARY OBJECTIVE OF YOUR OCCUPATION (Mark the one oval most pertinent):

1. FINDING AND DEVELOPING OIL AND GAS

Research	61	0
Seismic data acquisition and processing	88	0
Exploration evaluation	688	0
Field development	93	0
Other	41	0
	971	

2. FINDING AND DEVELOPING OTHER RESOURCES

Metals	644	0
Coal	33	0
Industrial minerals, including agricultural	44	0
Water	9	0
Other	17	0
	744	

3. GEOTECHNICAL APPLICATIONS

Environmental and health investigation	28	0
Construction and civil development	59	0
Hazard assessment	16	0
Other	13	0
	116	

4. PUBLIC POLICY ADMINISTRATION 60 0

5. GEOSCIENTIFIC EDUCATION, BASIC RESEARCH AND COMMUNICATIONS

Teaching	176	0
Basic research	245	0
Library	4	0
Museum	20	0
Journalism/Editing	8	0
Other	13	0
	466	

6. OTHER GEOSCIENTIFIC APPLICATION 49 0

7. NON-GEOSCIENTIFIC RELATED (i.e., an occupational objective that makes no material use of your geoscientific specialties) 54 0

8. NOT CURRENTLY EMPLOYED 125 0

N= 2,588

VII. YEARS OF GEOSCIENTIFIC PROFESSIONAL EXPERIENCE:

Less than 5	258
5-9	486
10-14	464
15-19	396
20-24	252
25-29	248
More than 29	460

N=2,564

VIII. NUMBER OF COMPANIES/ INSTITUTIONS WORKED FOR (FULL TIME ONLY):

0	43
1	686
2	681
3	472
4	285
5	170
More than 5	193

N=2,530

IX. TOTAL CURRENT ANNUAL EMPLOYMENT INCOME (IN U.S. $) FROM GEOSCIENTIFIC EMPLOYMENT (INCLUDE SALARY, BONUSES, AND CONSULTING FEES):

Less than $20,000	246
$20,000-$29,999	257
$30,000-$39,999	481
$40,000-$49,999	514
$50,000-$59,999	329
$60,000-$69,999	201
$70,000-$79,999	125
$80,000-$99,999	95
$100,000-$124,999	54
$125,000-$149,999	11
$150,000 and over	33

N=2,346

X. INDICATE YOUR MEMBERSHIP IN THE FOLLOWING GEOSCIENTIFIC ORGANIZATIONS (Mark as many ovals as are appropriate):

American Association for the Advancement of Science	39
American Association of Petroleum Geologists	442
American Chemical Society	6
American Geophysical Union	116
American Institute of Physics	4
American Institute of Professional Geologists	12
Association for Women Geoscientists	4
Association of Engineering Geologists	28
Association of Exploration Geochemists	113
Canadian Association of Geographers	52
Canadian Exploration Geophysical Society	64
Canadian Geophysical Union	115
Canadian Geotechnical Society	71
Canadian Institute of Mining and Metallurgy	835
Canadian Quaternary Association	86
Canadian Society of Exploration Geophysicists	323
Canadian Society of Petroleum Geologists	869
Canadian Well Logging Society	191
Geological Association of Canada	1,045
Geological Society of America	171
Mineralogical Association of Canada	245
Mineralogical Society of America	69
National Association of Geology Teachers	12
Royal Society of Canada	48
Seismological Society of America	6
Society of Economic Geologists	145
Society of Economic Paleontologists and Mineralogists	126
Society of Exploration Geophysicists	253
Society of Independent Professional Earth Scientists	1
Society of Mining Engineers of AIME	55
Society of Petroleum Engineers of AIME	32
Society of Professional Well Log Analysts	55
Other	767
	6,400
None	18
	6,418

XI. PRIMARY WORK LOCATION:

United States:	
Pacific Coast/Hawaii	1
Rocky Mountains	2
Southwest	6
Gulf Coast	1
Mid-Continent	2
East Coast	2
Alaska	0
	14
Canada:	
British Columbia	241
Yukon & Northwest Territories	88
Prairies	1,035
Ontario and Quebec	657
Atlantic Provinces	176
	2,197
Central America/Caribbean	1
South America	4
Europe	3
Middle East	1
Africa	4
Asia	6
Australia/Oceania	1
Other	3
	23

N=2,234

XII. RACE/ETHNIC ORIGIN

American Indian/Alaskan Native	8
Arab	6
Black	7
Caucasian	2,243
Hispanic	5
Asian/Pacific Islander	68

N=2,337

XIII. U.S. ZIP CODE OR CANADIAN POSTAL CODE OF OFFICE LOCATION (Blacken appropriate ovals in columns below):

U.S. ZIP CODE

CANADIAN POSTAL CODE

XIV. AGE:

Under 25	41
25-29	260
30-34	440
35-39	446
40-44	324
45-49	249
50-54	230
55-59	206
60-64	147
65-69	43
70 or over	49

N=2,435

XV. SEX:

Male	2,252
Female	200

N=2,452

XVI. CITIZENSHIP:

United States	73
Canadian	2,228
Other	94

N=2,395

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AGI programs and publications of related interest:

- North American Survey of Geoscientists, Summary - U.S. Section
- Geoscientific Employment and Hiring Survey - 1988
- Directory of Geoscience Departments
- Geoscience Student Enrollment Survey - United States and Canada
- U.S. Geoscience Minority Student Enrollment Survey
- Minority Participation Program:

  Scholarships
  Internships
  Seminars

- Careers in Geology and other career information

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